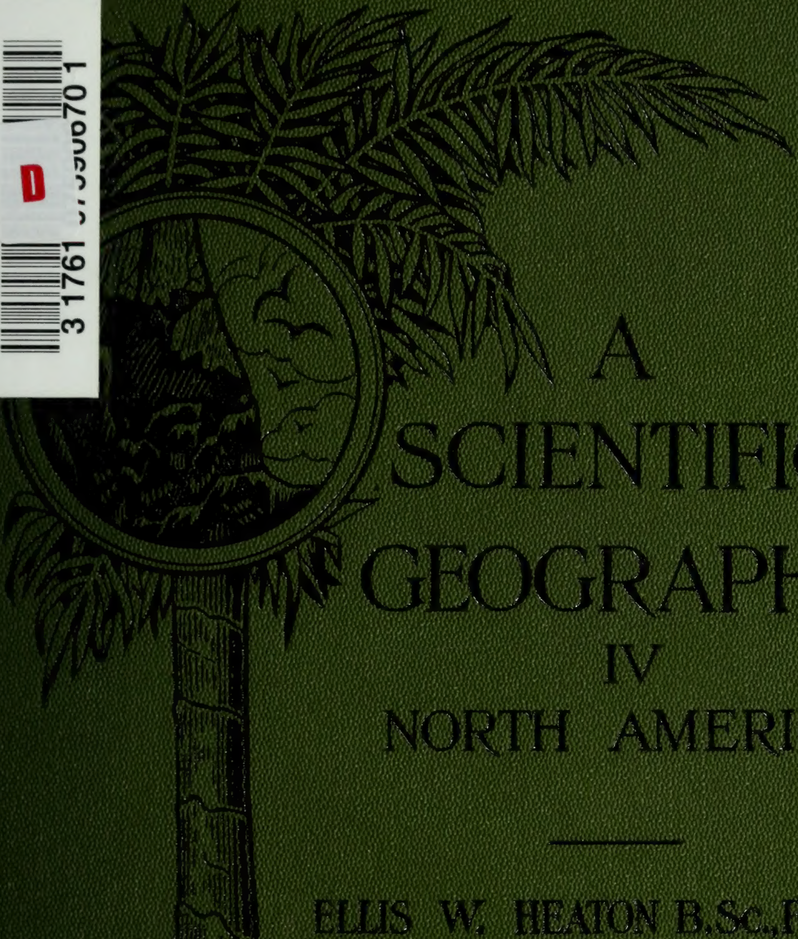

# A SCIENTIFIC GEOGRAPHY

## IV

## NORTH AMERICA

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ELLIS W. HEATON B.Sc., F.G.S.

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# A SCIENTIFIC GEOGRAPHY.

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## BOOK IV.

## NORTH AMERICA.

# A SCIENTIFIC GEOGRAPHY

BY

Ellis W. Heaton, B.Sc., F.G.S.

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# A SCIENTIFIC GEOGRAPHY.

## BOOK IV.

# NORTH AMERICA.

BY

ELLIS W. HEATON, B.Sc., F.G.S.

PRINCIPAL OF THE SECONDARY SCHOOL AND PUPIL TEACHERS' CENTRE,
NORTH SHIELDS.

86068
3/3/08

London:
RALPH, HOLLAND & CO.,
TEMPLE CHAMBERS, E.C.

1907.

# FOREWORD.

Students who intend taking Geography as a subject for Matriculation, Preliminary Certificate, Teacher's Certificate or Civil Service Examinations, will already be acquainted with the leading facts of the subject.

The aim of this book is to associate those facts in a way that not only makes them interesting, but affords at least some explanation of the facts—to be suggestive rather than exhaustive. More stress than is usual in text-books of Geography is laid upon physical causes which lead to agricultural and industrial developments.

Historical Geography is only incidentally treated because the writer considers it best to associate historic places with historical incidents in the courses of history taken by the student.

A glossary of common geological terms will be found at the end of the book.

The writer has had the valuable assistance of his friend Mr. Sidney Rossiter in revising the MSS. for press, and of his colleague Mr. S. R. Haselhurst, B.Sc., in revising the proof-sheets.

# PREFACE TO BOOK IV.---NORTH AMERICA.

Part I. of this book consists of general considerations in a series of five chapters, which should be read in conjunction with good maps of the geology, physical features, climatic conditions and industries of North America. (**Newnes' International Atlas,** 6s., covers all requirements). The student is advised to obtain the excellent outline maps of North America (1d., G. Philip and Son), and fill in the details of each chapter on separate maps.

Part II. consists of nine sections, each giving all the materials required for a sketch map, such as examiners ask for. The student should illustrate these sections for himself, by making sketch maps from any good atlas. Only in this way can the facts become his own.

ELLIS W. HEATON.

*August*, 1907.

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# GEOGRAPHY OF NORTH AMERICA.

## PART I.

## GENERAL CONSIDERATIONS.

### CHAPTER I.

### World Position, Discovery and Development.

[Maps to be studied: Terrestrial Globe; The World in Hemispheres; Mercator's Map of the World; Map of the Land Hemisphere.]

**Discovery and Development.**—The North American continent—so closely associated with English-speaking peoples that they refer to it as America simply—rivals the smaller continent of Europe in its advanced state of civilisation, and in the rapid progress of its communities. If we neglect the visits of the Northmen, by way of Iceland and Greenland, to the inhospitable shores of Labrador, we may say that until some four hundred years ago it was an unknown continent.

*Columbus* touched the West Indies in 1492, the *Cabots* gained the mainland in 1497, and *Cortez* reached California by way of Cape Horn in 1535; thirty years later the Spaniards, who had settled on many of the coastlands and islands of the South American continent, made their first settlement on the northern continent in the peninsula of Florida.

Religious persecution in the European countries, following upon the unsettling and disturbing movements of the

Renaissance and the Reformation, drove many to seek a new home in the newly-discovered continent. *French refugees*, attracted at first by the fishing grounds, penetrated the hitherto "dark continent" by way of the St. Lawrence and the Mississippi, along whose valleys they have left their traces in the names of towns, streams and states. To this day the dominant population of the lower St. Lawrence is French. British navigators, as far back as the sixteenth century, dreamed of a *North-West Passage*, but no explorer was able to steer his vessel along the entire passage until 1906, and then the feat was accomplished by a Norwegian (Captain Amunsden). But the dream led the British to explore and colonise Canada rather than the more southerly parts of the continent, where the influence of Spain was great and her naval power was strong. *Raleigh* and *Drake*, full of the adventurous spirit, ventured southward, in the year before the sailing of the Armada, as far as latitude 35 N., exploring the coastlands of what now are the states of Virginia (so-called in honour of Queen Elizabeth) and the Carolinas.

But colonisation on any systematic scale followed only after the death of Elizabeth and the close of the Tudor period. In the first ten years of the seventeenth century the *French*, who had explored the region in 1535, founded Quebec, and by 1615 had penetrated to Lake Superior. *Jesuit missionaries* were chiefly instrumental in the advance.

*Puritan families* from England and Holland sailed in the Mayflower in 1620 and established the first British colony, naming it Plymouth, after the port from which they had sailed. The *founding of Virginia* and *Plymouth* proved but the beginning of British settlement in the new continent, and before the close of the century the whole Atlantic coast from Newfoundland to Spanish Florida was colonised and organised into states. The inevitable conflict between the French and English on the St. Lawrence followed, and was only terminated after eighty years by the *Treaty of Paris in 1763*, since which date Canada has formed part of the British Empire. Only two years later came the irritation of the colonists at the taxation imposed in the reign of George III., which culminated in the *War of Independence* and the separation of the States from the mother country in 1783. The consolidation of the great Republic and its expansion westward to the Pacific seaboard are familiar history, whilst the friendly rivalry of the two sections of the British people in the continent, divided geographically by a line of latitude, but cemented in a filial relationship to the home country, has led to the prosperous and peaceful development of the tremendous resources of the continent.

**World Position and Dimensions.**—The vast continent of North America, *third* in order of size among the great land masses, is twice the size of Europe and half the size of Asia. In round numbers, its area is eight million square miles. In form it is often compared with a triangle, with its base in the Arctic Seas, but it is well to correct the idea given on a Mercator's map by reference to the globe. In the Mercator's map considerable *exaggeration of scale* occurs in high latitudes.

The early navigators of the fifteenth century had hugged the shores of the Old World, and gained the Cape of Good Hope and India. They had even ventured as far as the Eastern Archipelago, afterwards called the Indies. The new astronomical idea of the earth as a globe led bold spirits to argue the possibility of a *westward* voyage to India.

Columbus, a Genoese, and therefore within range of the new ideas, ventured west from Palos, his ships being carried by the N.E. trade winds. He gained the Indies, as he thought, tropical islands with coral reefs and volcanic peaks—still named the *West* Indies, to distinguish them from the *Eastern* Archipelago that Columbus set out to seek. The Cabots, as we have seen, venturing out from Bristol, reached the mainland by a parallel N.E.-S.W. track from that more northerly port.

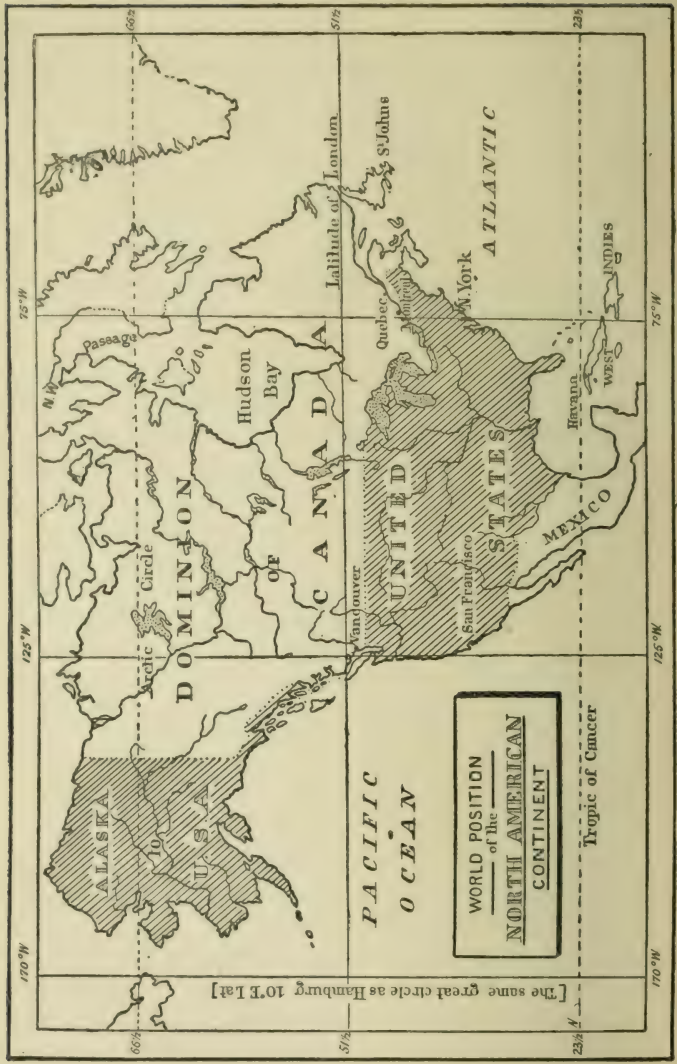


FIG. 1.—WORLD POSITION OF THE NORTH AMERICAN CONTINENT.

The unknown sea was the North Atlantic, now the busiest, most important and best explored of all the oceans. The nearest point of America (St. John's, in Newfoundland) is 1700 miles from the most westerly point of the European Archipelago (west coast of Ireland). So great has been the advance in the four centuries since Columbus that steamers could cover that distance in little over three days.

Columbus approached the Continent from the South, close to the northern tropic line. The Northmen of the tenth century approached it from Greenland, almost at the Arctic Circle. The Continent, therefore, stretches through the whole latitude of the temperate zone $\frac{66\frac{1}{2}-23\frac{1}{2}}{360}$ of $\frac{25000}{1}$ = nearly 3000 miles. Its width from St. John's to Vancouver, along the line of Canadian inter-oceanic traffic is about as long (3075 miles). The *Temperate climate* has favoured its development by the British race.

Separated from Europe by the narrow Atlantic (the "herring-pond" of the Americans), the American continent is divided by the wide expanse of the Pacific from Asia, off whose coasts lies the archipelago of Japan.

The round world is now girdled by a line of train and steamer traffic, roughly parallel to lat. 45° N., which bisects the American continent (*see* Fig. 25). The political boundary of Canada, where not defined by some physical barrier, is set at lat. 49°, some 4° further north.

Canada falls within the *cold* temperate belt; the States within the *warmer* south-temperate zone.

The North-West Passage is more arctic than Spitzbergen; the Gulf of Mexico is 10° nearer the Equator than the Mediterranean.

Montreal and New York are 75° W. of London, with noon five hours ($4 \times 75$ min.) later. San Francisco and Vancouver are in long. 125° W., whilst Bering Strait, whose submerged platform links the Old World with the New, is on the same great circle as Hamburg.

## CHAPTER II.

# The General Build of the North American Continent—Relation of Geological to Physical Features.

[Maps to be studied: Geological Map of North America;* Orographical Map; Map of River Systems.]

To the student familiar with the outlines of the geology of the British Isles and Europe, the structure of the North American continent is fairly simple.

Wherever stratified rocks occur, if we bore deep enough, we arrive eventually at the unstratified crystalline series at the base of the Primary rocks. These crystalline rocks appear to be the primeval floor on which successive sediments have been laid down, and from which they have been derived by denudation.

The **crystalline series**, well seen in our Scottish Highlands, in Scandinavia and in Finland, have their representatives on the American continent around the Hudson Bay. If we draw a line from the Arctic Ocean through the chain of lakes—which shows a striking parallelism to the Hudson Bay—as far as the St. Lawrence, we include within the curve the chief area of crystalline rocks in the continent. Over these rocks, not crumpled into axes as in Scandinavia and in Scotland, but gently sloping to the Hudson depression, as Finland does to the Baltic, many rivers converge to the Hudson Bay.

---

* Outline Map given on page 19.

Only along the St. Lawrence trend do we find a ridge—the Laurentide highlands—sending long streams to Hudson Bay and short streams to the St. Lawrence. Crystalline rocks occur in the central ridges of the two chief upfolds of the American continent, the ancient Alleghany ridges roughly parallel to the Atlantic coast, and the young cordilleran system of the lofty Rockies along the Pacific seaboard. In these cases, denudation subsequent to folding has revealed the *upthrusted* crystalline core. Crystallines and Primary strata are more prominent in the ancient Alleghanies, because denudation has continued through long geological epochs, whereas the Rocky Mountain system is of comparatively recent origin (like the Swiss Alps), and therefore lofty, because little denuded. Moreover, the Rockies have not yet attained stable equilibrium. Volcanic disturbances gave rise to many craters, and to lava flows along their flanks, in the early days of their existence; and earthquakes, consequent on settling, are still frequent on the Pacific flank of the chain.

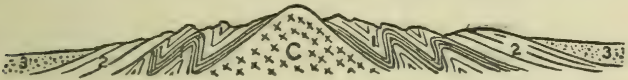


Fig. 2.—Generalised Diagram to Illustrate the Arrangement of Rocks in a Mountain-Uplift:

*C*—Crystalline core with Granite and Gneiss.
1. Primary; 2. Secondary; 3. Tertiary and Recent sediments.

The **Sedimentary rocks** fill the great basin between the Rockies and the above mentioned chain of lakes in Canada, and between the plateau of Colorado and the Alleghanies—*i.e.*, the whole catchment-area of the Mississippi, Missouri and Ohio rivers. They fill the trough of the St. Lawrence, and cover the coastal plain from New York to the low peninsula of Florida.

**Primary Rocks.**—The *oldest sediments* emerge from beneath later strata along the boundaries of the crystalline series. They occur especially in the valleys of the Alleghany ranges and the St. Lawrence rift, and recall the Primary rocks of Wales and the English Lake District. Limestones are, however, more prominent. The *Older* Primary rocks predominate in the St. Lawrence Valley. *Younger* Primary rocks—Old Red Sandstone, Coal Measures and New Red Sandstone—are well represented in the Alleghany system and its continuation northward to Newfoundland. Porous rocks of Old Red Sandstone age contain great stores of petroleum; coal measures are extensive and in many places folded as in our South Wales coalfield. Along the eastern edge anthracite has been formed as a result of excessive folding. New Red Sandstone is feebly represented on the eastern flank and in Prince Edward Island.

Large coalfields of the Russian type—nearly horizontal strata, uplifted in gently folded domes—occur in the Mississippi basin as far west as longitude 100° W., but they are comparatively poor in coal.

The Rockies are practically devoid of coal. A few small coalfields occur on the Pacific seaboard of Canada.

**Secondary Rocks.**—Secondary rocks, here and there overlain by Tertiary sediments, form a broad belt along the eastern flank of the Rocky Mountain system. The salt-bearing strata at the base of the series are well represented on both flanks of the Colorado plateau. Copper slates, resembling those of Germany, occur in rocks of this age among the Alleghany valleys. The Connecticut valley, especially, yields good building stone, of upper New Red Sandstone age, largely used in New York.

American Secondary rocks differ from British facies of the same age in including *coal-bearing strata.* Coalfields of New Red Sandstone age occur in the southern Atlantic states. Others of so late an epoch as that of the English chalk occur in a series along the line of longitude 105° W. between the Rockies and the Missouri, and cover an area of 50,000 square miles. Secondary Coal Measures are barely represented in the British Isles. Chalk is not so prominent in the American series, though well represented in Texas.

Volcanic rocks, conspicuous by their absence from British Secondary rocks, occur in American Secondary rocks. The volcanic activity may be associated with mountain-upheaval which had preceded it, and the crust adjustments which have accompanied it. The Rockies had still to attain their maximum uplift when the Secondary epoch closed.

Secondary rocks underlie the Tertiary coastal plain of the Gulf of Mexico, Florida and the Atlantic border.

**Tertiary Rocks.**—The forces which gave the final uplift to the Rocky Cordillera led to the emergence of the continental interior above sea level. Only the present coastal plains were submerged in Tertiary times, and it is on them that we find the clays, loose sands and gravels so characteristic of Tertiary basins. Tertiary seas crept up the basin as far as the present junction of the Ohio with the Mississippi. A series of fresh-water lakes (*Cf.* the Great Lakes of the St. Lawrence system) occupied the surface of the Secondary belt, and left Tertiary patches thereupon. To these we have already alluded. They form the in-fertile "Bad Lands" of the prairie country, the *mauvaises terres* of the early French colonists.

The grand phenomena of the Tertiary period were the immense lava-outpourings which, when consolidated, formed the broad plateaux, now carved into segments by the deep ravines cut (under a rainless climate) by the Columbia, Snake and Colorado rivers, which derive their waters from the culminating snow-clad range beyond the plateaux. These basaltic plateaux, thousands of square miles in area and thousands of feet in thickness, recall the contemporaneous Tertiary basalt flows of Antrim, the Inner Hebrides and Iceland.

Yellowstone Park was the scene of volcanic activity when the German Eifel and the French Auvergne were being covered with cones and débris. A whole line of lofty volcanic peaks arose along the Pacific flank of the great uplift.

The structure of the Rocky Mountain system is more complex than that of the Pyrenees and Alps in Europe. Folding and faulting have gone on together, giving a complicated series of folded ranges of uplift and crust-blocks. The general arrangement is one of folded ranges along the rims of the system with crust-blocks in the interior; hence the plateau character of the system.

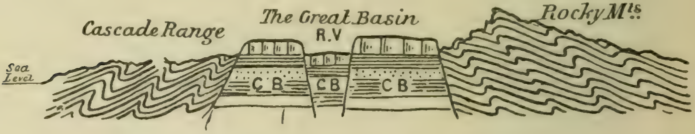


Fig. 3.—Section across the Rockies.

Summarising, we have:—

(*a*) The crystalline floor of the Hudson basin.

(*b*) The Primary axis of the Alleghanies and the rift-valley of the St. Lawrence.

(*c*) The Secondary strata of the prairie-lands west of the Great Lakes and the Mississippi.

(*d*) The Tertiary and Recent coastal fringes of the Atlantic (from New York to Florida), the Gulf of Mexico and the Pacific coast south of Vancouver.

(*e*) The grand complex of the Rocky Mountain system with crystalline cores, sediments of every geological epoch, structures of every geological type, and volcanic features nowhere surpassed on the globe—an axis which existed from early geological times, but which only culminated in the Tertiary epoch.

**Glacial and Alluvial Deposits.**—There remains to be considered the modification of the surface and soil by the incoming of the *Ice Age* at the close of the Tertiary epoch.

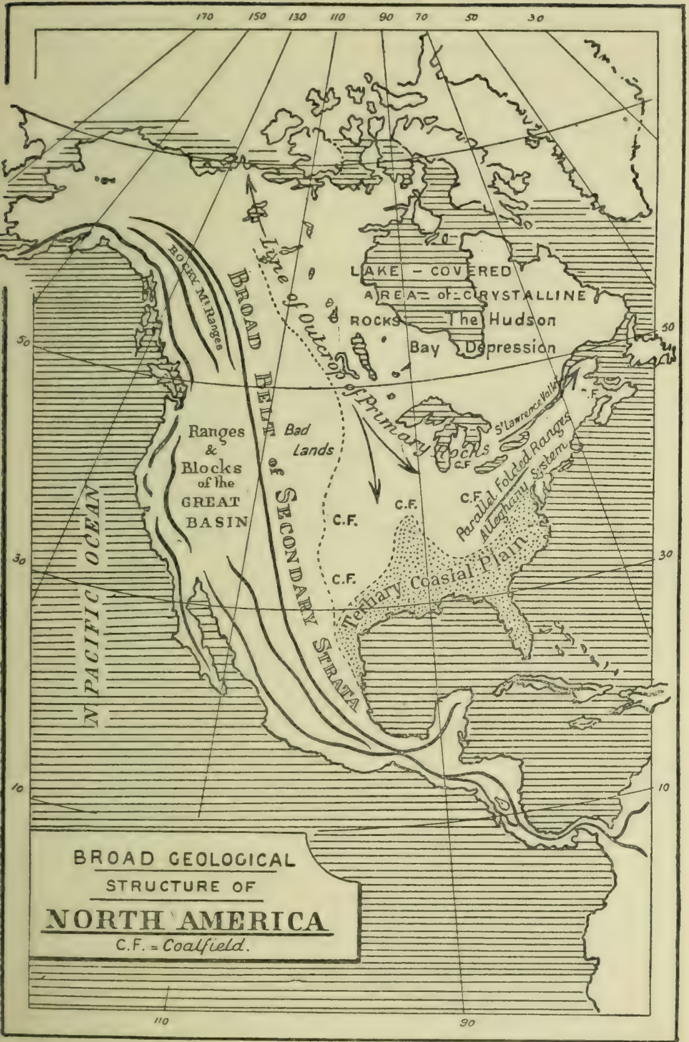

BROAD GEOLOGICAL STRUCTURE OF NORTH AMERICA
C.F. = Coalfield.
LAKE-COVERED AREA of CRYSTALLINE ROCKS
The Hudson Bay Depression
ROCKY Mt. Ranges
BROAD BELT of SECONDARY STRATA
Line of Outcrop of Primary Rocks
Ranges & Blocks of the GREAT BASIN
Bad Lands
C.F.
C.F.
C.F.
C.F.
C.F.
C.F.
St. Lawrence Valley
Parallel Folded Ranges
Alleghany System
Tertiary Coastal Plain
N PACIFIC OCEAN
170
150
130
110
90
70
50
30
50
30
10
50
30
10
110
90

FIG. 4.—BROAD GEOLOGICAL STRUCTURE OF NORTH AMERICA.

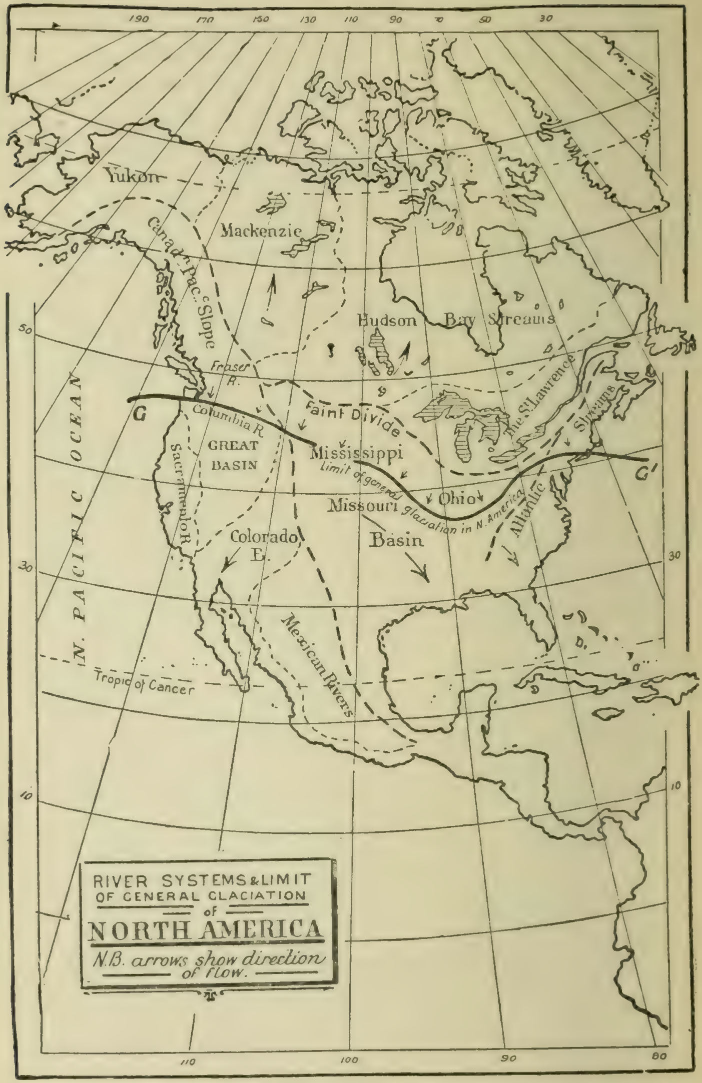


Fig. 5.—River Systems of North America.

Canada, the northern half of the continent, was the region of the great *ice-caps*. Centres of radiation of the ice-flows lay respectively east and west of the region occupied now by the Hudson Bay. Glaciers descended from the Rocky Mountains to the Pacific seaboard. The Hudson Bay ice-flows penetrated as far south as the present drainage lines of the Missouri and Ohio. South of these rivers, and the Frazer and Hudson rivers on the west and east coast respectively, ice sheets only occurred in high parts of the great basin.

Thus the prairie and wheat lands of Canada, the grain states which occupy the angle between the Missouri and Ohio, the Canadian Pacific seaboard, the St. Lawrence valley and the New England states have all been subjected to the rigour of an ice age, and are more or less mantled with glacial deposits, which form the surface soil of the various districts. The student will see that actually the *terminal or frontal moraines* of the ice-cap have determined the course of the two streams—the Missouri and Ohio—and their point of coalescence. Lakes left by the retreat of the ice-cap at the end of the Glacial epoch, and subsequently filled by sediments brought by streams from the melting ice (*Cf.* Switzerland) have given rise to the fertile soils of the grain districts around Winnipeg and St. Paul.

## CHAPTER III.

# Climatic Conditions on the North American Continent and Their Bearing on Agriculture.

[Maps to be studied: Isothermal and Isobaric Maps; Rainfall Map; Map of Ocean Currents.]

**Range in Latitude — Belts of Climate.** — The southern extremities of the continent lie close to the *northern tropic*; the northern base of the triangle formed by the continent falls within the *Arctic Circle.* Over a continent of such an extent in latitude climate must vary considerably. On the continent of North America the variation of climate is much simpler than on the continent of Europe. Many causes contribute to produce this. The *long barrier* of the Rocky Mountain axis, presented almost normally to the winds and

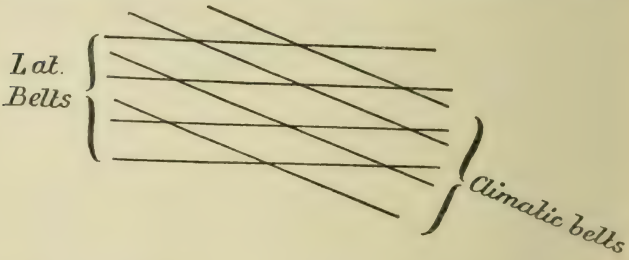


Fig. 6.—Relation of Latitude to Climatic Belts East of the Rockies.

ocean drifts of the wide Pacific, is the decisive factor in North American climate. East of this wall the belts of climate run parallel to each other in a W.N.W.-E.S.E. direction across the continent, as an isothermal map of mean annual temperatures shows.

West of the Rocky Mountains the strip of continent is so narrow that belts of climate are not so distinctive. The type of climate along the western seaboard is *insular*, whilst that over the Rockies on the long slope to the Atlantic seas is *continental*, gradually decreasing in severity of extremes as we travel from the leeward-side of the Rockies (the prairie country) to the eastern coast.

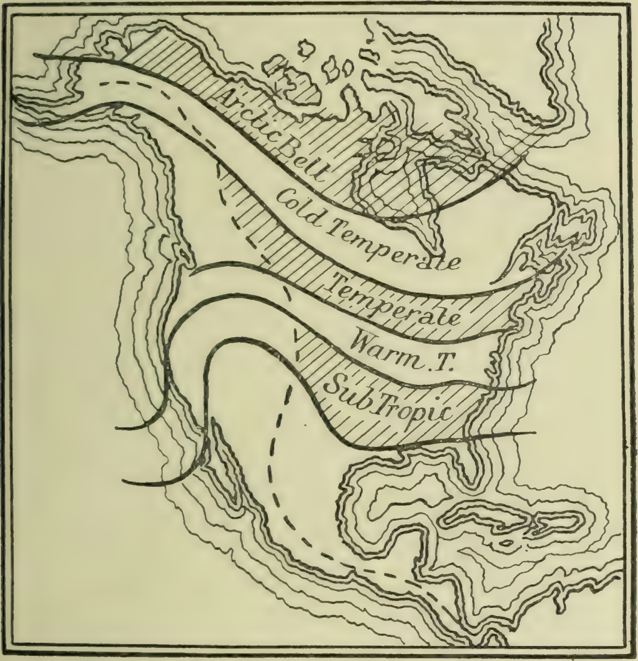


FIG. 7.—CLIMATIC ZONES.

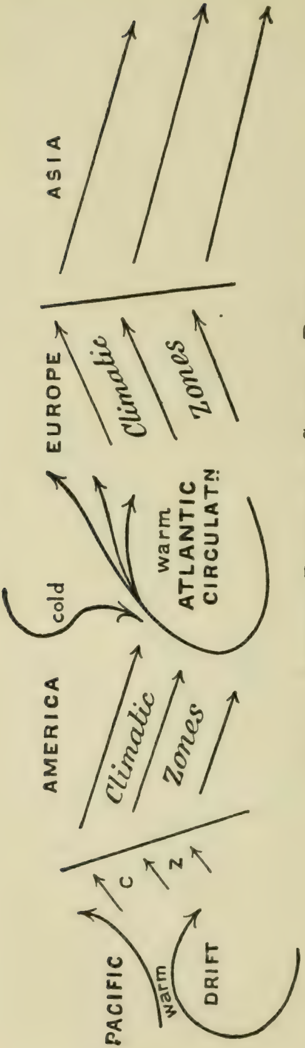


FIG. 8.—GENERAL DIAGRAM OF CLIMATIC BELTS.

Extremes are again more marked in the north than in the south. The great inland sea of the Gulf of Mexico, with its warm oceanic drift, is responsible for the insular type of climate which prevails on the Tertiary coastal plains of the southern states of the Union. The Alleghany ranges are not of sufficient altitude, and are not placed at a sufficiently normal angle to the winds and oceanic circulation of the Atlantic to form a marked climatic barrier.

Fig. 8 illustrates the general arrangement of belts of climate over the Northern Hemisphere, where continent alternates with ocean. It also brings out the fact that the climate of North America must, on the whole, be compared with that of Asia rather than with that of Europe, only British Columbia and California, and similarly placed countries on the west of the Rockies, being comparable with Western Europe.

It will be gathered by a study of the isotherms and their included temperature belts (*see* Figs. 9 and 10) that places in a given latitude are much colder in January than similarly placed countries in Europe; *e.g.*, Hudson Bay and the Baltic Sea, the Great Lakes and North Italy. On the other hand the *prairie lands* of the interior are considerably hotter in July than any part of Europe in the same latitude. Such facts are evidence of the more continental type of climate which prevails over America.

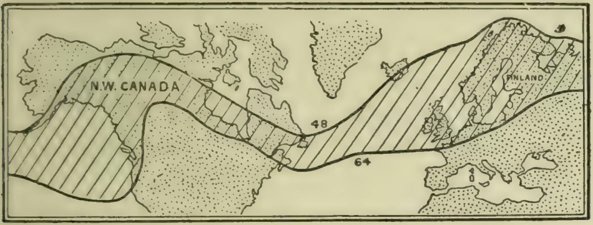


FIG. 9.—JULY TEMPERATURE BELT.

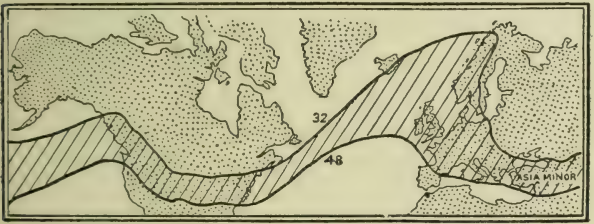


FIG. 10.—JANUARY TEMPERATURE BELT.

**Winds and Ocean Currents.**—The explanation is to be found in the direction of air and water circulation over the Atlantic. The warm south-west winds, which make the climate of Western Europe genial, are part of a circulatory motion which does not favour the continent of America, except along the coast of the southern states.

Cyclones born in low pressure areas over the continent of America have a predominant trend S.E. over that continent, and N.E. over the Atlantic; over the former they travel carrying colder conditions, while over the ocean they gather heat and distribute it in colder latitudes.

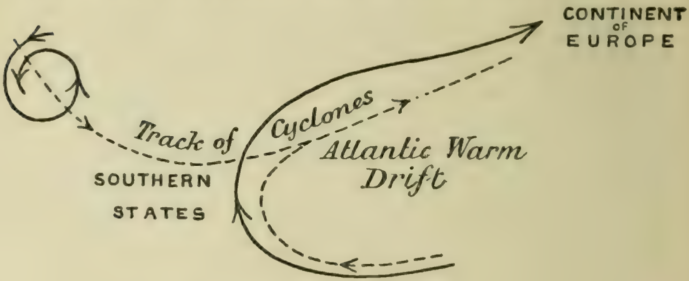


FIG. 11.—STORM TRACKS.

The Pacific seaboard is similarly placed to the Atlantic countries of Europe, though in the wider ocean the warm drift and ocean winds drive in from the west rather than the south-west.

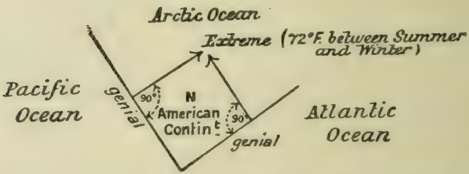


FIG. 12.—RELATION OF GENIAL SEA-BOARDS TO EXTREME INTERIOR.

The Rocky Mountain wall is a most important climatic barrier, owing to its interception of the rain-bearing west winds which blow in from the Pacific. The student has only to compare the map of annual ranges of temperature with that of annual rainfall to discover that the regions of extreme range are those of low rainfall, whilst those of minimum range are regions of maximum rainfall. The long slope from the Rockies to the Hudson Bay is a typical "rain-shadow" area, comparable in range (60°-70°F.) and climate with the plain of South Russia, and is the most continental in type on the North American continent. Only Siberia—on the larger continent of Eurasia – has a more extreme climate. The rainy slope of the Pacific extending from San Francisco to Sitka, a comparatively small distance away, has but an average range of 20° F.

The outstanding fact of the extreme continental climate of the north is further explained by reference to the great *variation in the length of day* in regions of high latitude. The great North-west of Canada has long, dry days in summer, followed by equally long nights in the winter, *i.e.*, extremes of duration of sunshine—the maximum period affording great heat, the mid-winter minimum resulting in extreme cold. In the southern states not only rainfall, but a roughly *equal distribution* of sunshine throughout the year, serve to explain the equable or insular nature and low range of the climate.

Two regions of North American climate remain to be noted. The first of these is the practically *rainless region* of the Great Basin, enclosed between the Cascade Range and the Rockies of the western states, which, in July, is one of the three *hottest regions of the world*, considerably hotter than the equator itself. The sun is directly over the Tropic of Cancer on Midsummer Day, but the land mass—so susceptible to heat, and in this particular area untempered by rainfall—draws the area of extremes still further north until the region of greatest heat falls almost entirely *outside the tropics*.

The second of these two regions, the coastlands of the North-West Passage—so long the allurement and the despair of explorers, but in 1906, for the first time, navigated with success—lies in the area of extremest winter cold on the Continent. The region is a bay of polar climate projecting

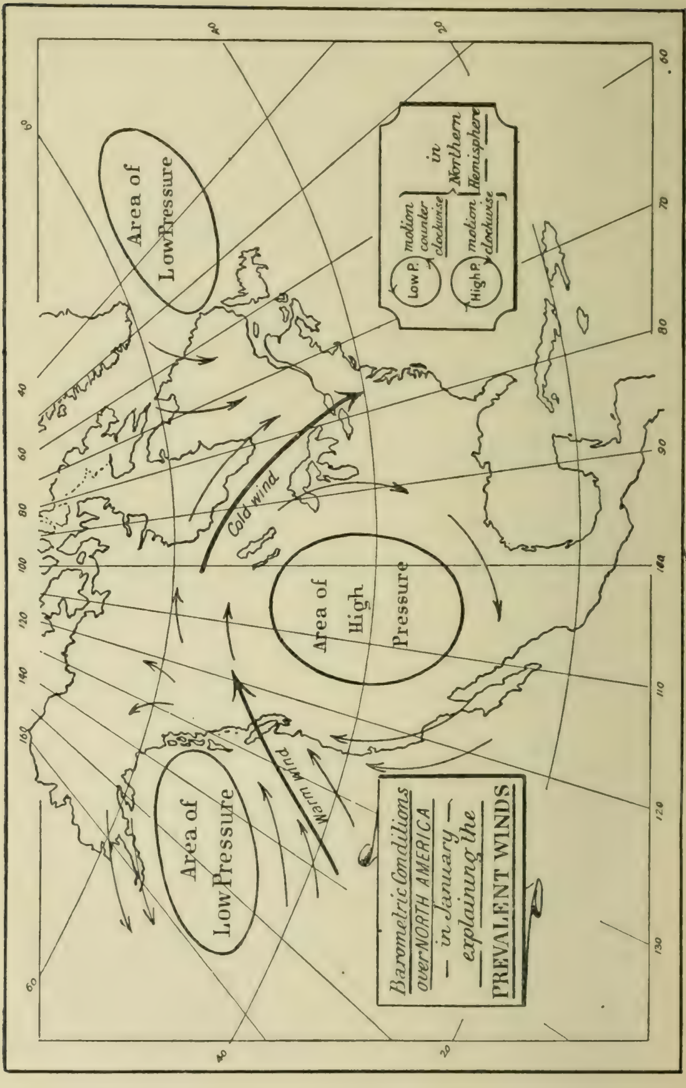


Fig. 13.—Barometric Conditions over North America in January explaining the Prevalent Winds.

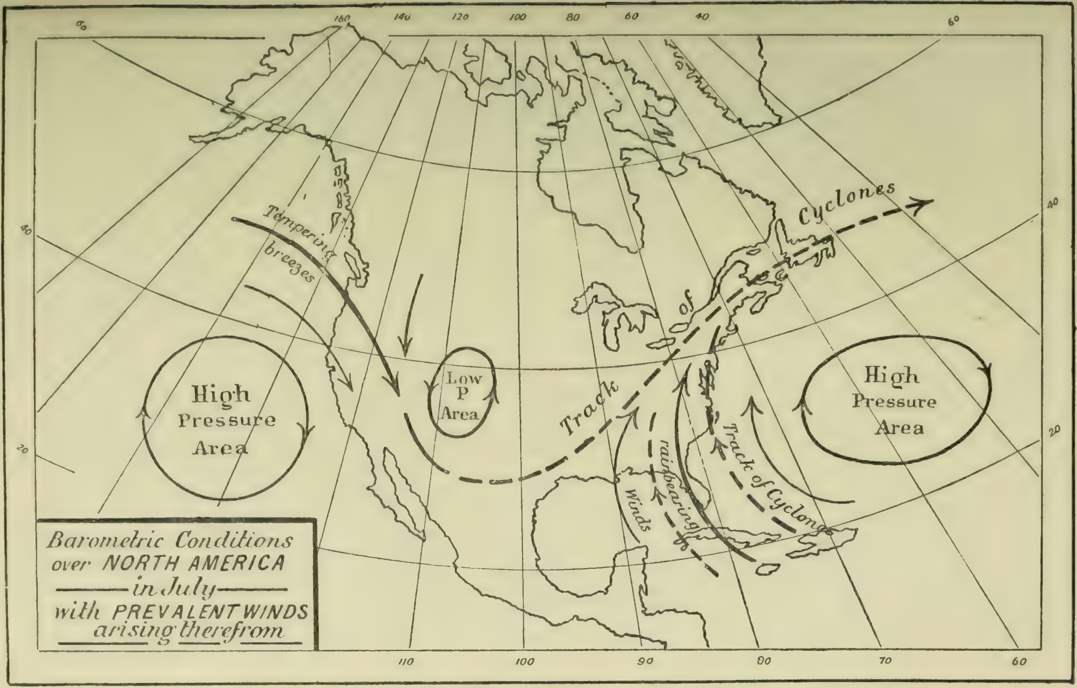


FIG. 14.—BAROMETRIC CONDITIONS OVER NORTH AMERICA IN JULY, WITH PREVALENT WINDS ARISING THEREFROM.

southward over Canadian territory, even beyond the Arctic Circle, and colder than Spitzbergen, which lies 10° nearer the Pole.

A map of isobars (lines of equal barometric pressure), further serves to explain the interesting features of North American climate.

**Prevalent Winds.**—The *January* diagram explains the extreme cold of Lower Canada and the eastern states, arising from winds blowing from the north-west, as well as the genial winters of California, influenced by inflowing warm winds from tropical Pacific waters. (Fig. 13.)

The *July* diagram shows the tempering influence of cool sea breezes from the north-west on the western states, and the rainy conditions of summer climate in the Southern States. The average track of cyclones is inserted for comparison. (Fig. 14.)

[*See* Book I., *The World—Broadly Treated*, for Explanation of the Laws which Govern Climate.]

**Vegetation, Forestry and Agriculture.**—The student will readily understand that climate and soil determine the natural vegetation of a continent as the coloniser first meets it. The soil is perhaps a less important factor than either temperature or rainfall. A considerable supply of rainfall, accompanied by the lesser effects of insolation and frost, will secure the degradation of the hardest surface into fairly fertile soil. It is the rainless region that is barren in soil. Temperature determines the character of the vegetation, whether Tropic or Arctic, or of an intermediate type. Original vegetation and subsequent agriculture are largely determined by the climatic provinces into which a continent is naturally divided.

**Climatic Units.**—

In Canada it is easy to distinguish five such climatic and productive units.

(1) The Valley of the St. Lawrence,
(2) The Grain-lands of the Interior,
(3) The Pacific Border,
followed by the Canadian Pacific Railway.
(4) The Hudson Bay Depression,
(5) The dreary Tundras of the Arctic Coastlands and Archipelago.

The States, lying further south, offer contrasts whilst affording points of comparison. They may be divided as follows:—

(1) The New England States,
(2) The Mississippi Basin, east and west,
(3) The Pacific States,
*Cf.* (1) (2) (3) above.
(4) The coastal plain of the Gulf of Mexico (a depression),
(5) The barren "Great Basin" on the Rocky Mountain uplands.

Numbers (4) and (5), respectively a basin and a desert in both countries, afford the *widest contrasts* of temperatures and of productions to be found on the Continent.

(1) *Valley of the St. Lawrence and the New England States.*—The valleys of *Lower Canada* and the *New England* states have a climate corresponding closely with that of the *Baltic* depression in Europe—warm and dry in the summer and sufficiently cold in the winter to block the mouth of the St. Lawrence with ice. Forests like those of Sweden and Finland, growing on a similar geological formation, give rise to the lumbering industries of the St. Lawrence valley. Dairy farming thrives amid the parallel ranges between the St. Lawrence and Nova Scotia. Fruits of English and French character ripen in the warmer latitudes of Toronto and Buffalo in the region of Lakes Ontario and Erie, and the valley of the Hudson.

(2) *Canadian Grain-lands and the Mississippi Basin.*—The forests give way to *grass-lands* as we move to the drier *interior*, especially beyond the Great Lakes and the Mississippi. Whilst the low rainfall is unfavourable to the growth of forests, the warm, dry summers are especially suitable for the ripening of grain; wheat, rye and maize are grown in immense quantities on the alluvial and morainic soils of the interior; rye extends further north than wheat, maize further south. The whole nature of the climate and productions recalls the great open *Plain of Russia.* Even Siberia, with its long, warm, dry summer days, is emulating Manitoba in the development of wheat farms. The poorer grass-lands are given up to ranches—farms for the rearing of live stock.

(3) *The Canadian Pacific Border and the Pacific States.*—The *Pacific border* is unlike the rest of the continent in both climate and productions. It is comparable in Canadian territory with the *British Isles*, and in the Californian region with the *Mediterranean.*

The mountain-slopes support magnificent forests as far north as latitude 60° N., and afford much lumbering. The fertile garden of California is one vast orchard, yielding fruits of French and Mediterranean types.

(4) *The Hudson Bay Depression and the Coast of the Gulf of Mexico.*—The *two great depressions* of the American Continent, the *Hudson Bay* and the *Mexican Gulf* regions, afford remarkable contrasts.

Geologically, they are as wide apart as can be; crystalline rocks belonging to the *oldest* epoch form the basin of the Hudson Bay, while the coastlands of the Gulf of Mexico and Florida, with their extension along the Atlantic border as far as Cape Hatteras, represent the *newest* lands on the American Continent. Climate is equally widely contrasted. Arctic conditions of the severest type seal the mouth of the Hudson Bay for months in the year with ice. Only the *James Bay* region can be compared with the *White Sea* of Northern

Russia, and it lies in the latitude of England; and here mosses and lichens give way to pine trees. The *Gulf of Mexico*, on the other hand, just outside the Tropics, has a *tropical* climate, owing to the cauldron-like circulation of warm currents from the Equatorial belt—currents which issue at the Straits of Florida in the remarkable *Gulf Stream*. Rice, cotton and sugar thrive in the hot, damp climate of these coastal plains. The slopes of the limestone hills of Tennessee and Kentucky ("the blue-grass States"), north of these plains, as well as those of Virginia, overlooking the Atlantic slope, yield much tobacco.

(5) *Arctic Coastlands and the Rocky Mountain Uplands.*—The *frost-bound* tundras of the Arctic shores of Canada present an extreme contrast to the *burned-up* basin on the elevated plateau between the Rocky Mountains and the Sierra Nevada, the hottest region on the American Continent—50° F. hotter in summer and 80° F. hotter in winter than Arctic Canada. Nowhere in the world can a more marked change in climate and fertility be found than on the two sides of the Sierra Nevada range, in lat. 35° N. The "big trees" of Mariposa and Yosemite grow on the rainy slope, above the gardens of California. Prickly cacti and scrub prevail on the dry plateau of the Great Basin.

## CHAPTER IV.

# Mineral Resources, Industries and Population Centres.

[Maps to be studied: Geological Map; Industrial Maps; Railway Maps.]

AGRICULTURE tends to *distribute* the people over the land; manufacturing industries lead to an *aggregation* of the population in groups of towns around a central metropolis. In the former case it is not only fertility but also the *stage of development* reached which determines the density of population over a given area.

Fertile tracts long settled, as in the St. Lawrence Basin and New England States, support more people than the equally fertile but only recently-developed prairie lands of the west. With the increase of facilities for transport and export, the thinly-peopled virgin-lands of the west may be expected to support a much larger population.

*Coalfields* and *traffic-lines* form the areas and loci of dense populations, and these factors combine to make the earliest settled and fertile states of New England and the Laurentian provinces of Canada the busiest areas on the North American continent.

*Mining centres*, apart from coalfields, are but sparsely populated; the ore is sent to the coal regions to be smelted, and so a railway to the nearest coalfield or the handiest point of export becomes a necessity.

**Older Primary Rocks.**—*Iron* ores are usually associated with the coal deposits of the younger Primary rocks. *Lead* ores are common in the ancient limestone, which in many countries (including the above thickly-populated areas) forms the basin in which the Coal Measures are laid down.

*Gold*, *Platinum*, *Silver-lead* ores, *Copper*, and especially the native metals (gold, silver and copper) more often occur along *lines of fracture* of the earth's crust, and therefore on the flanks of mountain uplifts and the *rims* of block mountain-plateaux. This is very strikingly illustrated in Europe in Germany, Bohemia, Spain and the Urals. (*See* Europe, Fig. 12.)

*Copper* and *Nickel* are associated in the quartz veins of the crystalline rocks along the northern edge of the Great Lakes, *i.e.*, along the line of the Canadian Pacific Railway. The nickel remains to be worked, the copper has been considerably exploited, while recently rich *gold* supplies have been detected in the same region.

*Graphite* occurs in considerable quantity. *Iron*, of the magnetite ($Fe_3O_4$) variety (seldom found in coalfields), is mined in these ancient crystalline rocks, both on the Canadian and New England sides of the St. Lawrence. The valuable mineral *Apatite* occurs in masses.

The older Primary rocks of Michigan and the St. Lawrence trough yield good *building stones*, *slates* and, in the folded ranges between the trough and the coast, *marbles*—derived from the metamorphism of ancient limestones. Many of the porous sandstones and dolomitic limestones afford storage for *natural-gas* and *rock-oil*.

**Younger Primary Rocks.**—The great mineral wealth of the Continent in *oil*, *iron* and *coal* is, however, chiefly associated with the younger Primary rocks. The porous sandstones of Old Red Sandstone age which encircle Lake Erie and crop out from beneath the huge coalfield of Pennsylvania, form the chief storehouse of *petroleum*. The oil is the product of destructive distillation of organic matter—effected by heat and pressure in the process of mountain making—lying below the porous sandstones, into which the natural gas and oil have distilled. The limestone which occurs sandwiched between these oil-bearing strata and the coal seams, has *lead-ores*, like its English equivalent.

The *Coal Measures* cover an enormous area in the basin of the Ohio, and flank the Alleghany ranges on the interior slope from Pennsylvania to Alabama. They have their widest extension in the former state. In the west the seams lie *horizontally*, but in the east they have been involved in the process of mountain making—that of the final uplift of the Appalachian axes—and as a consequence have been *folded*, crumpled and converted largely to *anthracite*.

*Cannel* coal, the "parrot" coal of Scotch miners, occurs on the western edge, in the Ohio Valley, and is, as its name (=candle) implies, excellent for gas-making.

*Bituminous* coal, the best for household purposes, is mined on the plateau; *anthracite* in the eastern valleys. True coal-basins of considerable extent occur in Michigan, between the lake of the same name and that of Huron; in the angle between the Mississippi and the Ohio; and again, across the great river, S.E. of St. Louis.

**Secondary Rocks.**—*Coal* is not confined to rocks of what we call the Carboniferous age. Soft coals, covering tens of thousands of square miles in area, occur in the belt of Secondary rocks which flanks the eastern rim of the Rocky Mountains. They belong to the age of our English chalk, but point to very different conditions of deposit. Belonging to a much later epoch than the Carboniferous, and having been subjected to comparatively little pressure from overlying strata, they are not so compacted, and are much richer in volatile compounds than ordinary coal. It is interesting to note that at Brora, in Sutherland, North Britain, there is a small deposit of similar character and age. The coalfield of Richmond, Virginia, is of New Red Sandstone age.

*Salt*, which in England is usually associated with the New Red Sandstone, is not confined to these rocks, but occurs also in both older and younger rocks in America. This New Red Sandstone is one of the principal building stones in the great cities of New England.

*Gold* is scarce in the ancient Appalachian axis. In the Rockies, on the other hand, it was the chief incentive to mining industry. It occurs disseminated in small flakes in the quartz veins and "auriferous slates" (Secondary rocks) of the Pacific flank. But it was first discovered in the *alluvial deposits* ("placers") of the rivers of the Pacific seaboard, and from them it was first obtained by various methods of separation, made easy by the high specific gravity (19·3) of gold as compared with quartz (2·5). Now the metal has been traced back to its source, and the degradation of the gold-bearing rocks—the result of ages of denudation in the ordinary processes of nature—is rapidly effected by crushing-machines (*i.e.*, stamps).

California has exported gold for half a century. The valleys leading down to Vancouver were next explored; new deposits are being opened out further north, and will lead to the development of Fort Simpson: the immense field of Klondyke, close to the Arctic Circle, is now being worked with great success.

*Silver* and *Lead* occur in the same fractured mountain rims, the western range being again more productive than the eastern. The United States mines rank *first* in the world for the output of silver.

**Tertiary and Recent Rocks.**—The coastal plains and the lake deposits of the interior offer little in the way of mineral wealth. *Diatomaceous earth*, used in the manufacture of metal-polish, and non-crystalline *phosphates* (similar to those occurring in East Anglia), useful as manures, are found along the southern Atlantic states.

**Industries and the Distribution of Population.**—We are now in a position to understand the distribution of population over the continent.

The *Tundras belt* within the Arctic Circle and the Hudson Bay depression, as well as the *arid plateau* of the Colorado basin, are the areas of scantiest population. The *great forests* support a sparse population, chiefly gathered at the saw-mills and paper-factories at the outlets of the valleys. The wide *prairies* are scarcely more densely peopled; towns spring up at centres suitable for flour-milling and conveniently placed for export. Winnipeg is the best example in Canada. Chicago, far outstripping Winnipeg, is the American focus.

The *fertile valley* of the St. Lawrence, brought to a high pitch of cultivation, and the *genial fruitful lands* of the Pacific seaboard support a dense population for agricultural areas.

Similarly, the *rich, damp, hot, coastal plains* of the southern states—yielding crops of rice, sugar, cotton and tobacco—find employment for large numbers of negroes, descendants of the slaves of a former century. Galveston, New Orleans and Mobile on the Gulf of Mexico, Savannah and Charleston on the Atlantic, busied in the export trade, and more recently in manufacture also, are the foci of population in these states.

The agricultural produce of the great interior finds its way to the *river-ports* on the Mississippi and its tributaries. *Milling* and *packing* lead to the aggregation of people at these points of export and exchange: St. Paul, St. Louis, Cincinnati, Cairo and Memphis are such centres.

In the same way, the *highway of the St. Lawrence*, so thoroughly canalised, and the Great Lakes, carrying navigation to the heart of the interior, only 400 miles from the wheat-lands of Manitoba, have led to clusters of towns at the

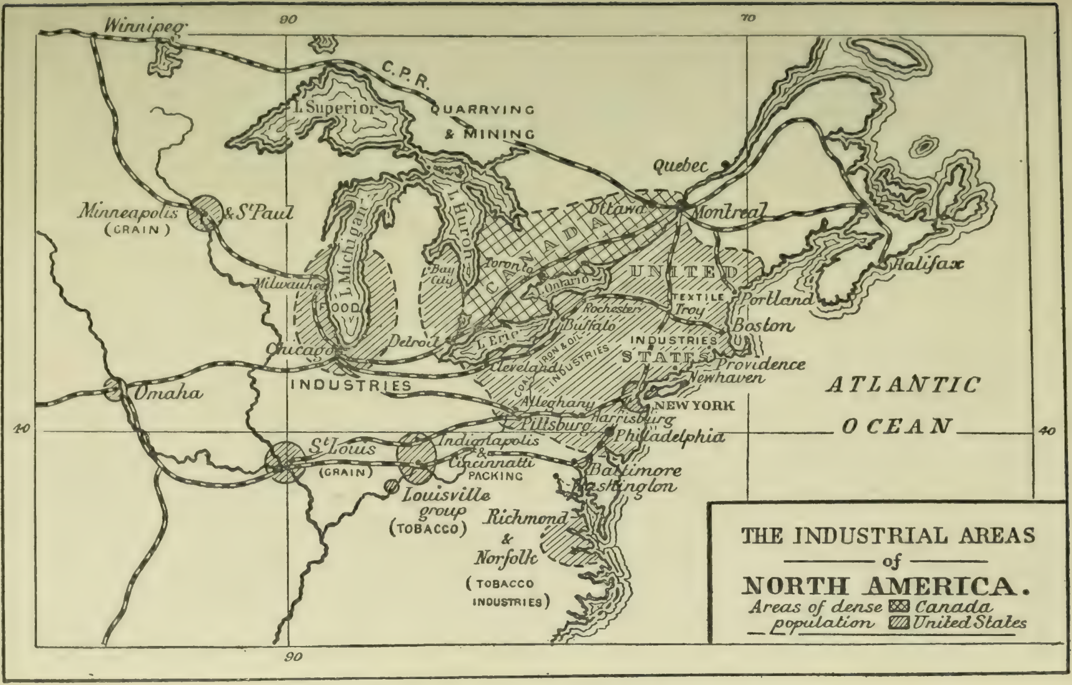


FIG. 15.—THE INDUSTRIAL AREAS OF NORTH AMERICA.

*crossing-points* and other suitable sites. Chicago and Detroit, Toronto and Montreal are centres of population.

The untold *mineral wealth* around the Great Lakes, in the Ohio Basin, and on the flanks of the Alleghanies, accounts for the fact that the *most densely populated region* on the continent lies between the Laurentian lakes and river on the west and the Atlantic seaboard on the east.

Cleveland and Buffalo, on the "States side" of the water frontier which divides them from the Dominion; Pittsburg, in the midst of the *oil-wells*, *iron-mines* and *coal-fields* of the Ohio Basin; Boston, New York, Philadelphia, Baltimore and Richmond, *on the open Atlantic*, *facing Europe*, are all foci of dense populations.

The States of New England—most English in character among all the States of the Union—contain the principal seats of the *textile* industries. Cotton and woollen goods are woven. *Watch-making* is an important industry. Across the Alleghanies, the *iron and steel industries* flourish in the Pittsburg group of towns. *Oil-export* engages thousands in the Ohio Valley, both upper and lower. Cleveland is a busy centre of export on the Lake-highway. Buffalo and Rochester share in the industries of the Ohio Valley.

Cincinnati and Chicago, the latter the city of most prodigious development in a country of rapid strides, are centres of the *grain and meat industries.*

Detroit is the focus of industry in Michigan. It has special importance in copper.

Ontario's life converges on Toronto. Montreal is the emporium of Lower Canada.

Denver, where railways converge before climbing the Rockies, is a subsidiary population centre. Mining industries in the neighbouring mountains account for the aggregation of people.

The "Gates of the West," Vancouver (British Columbia) and San Francisco (California), are the foci of commerce along the Pacific seaboard.

Vancouver has excellent *coal*; the harbour of Esquimault forms a fine meeting-place for ocean-going vessels and Trans-Canadian trains.

San Francisco is the natural outlet of the *fruit-farms* of the Sacramento Basin. The terminus of the principal lines of railway across the States, from ocean to ocean, with the finest harbour on the coast, it has inevitably become the focus of shipping, export and import, between the States and Australia, Japan, China and the Philippines.

The *salmon-fishing* ground of the fiord-like Puget Sound, just south of the lat. 49° N. frontier, has attracted population to the neighbourhood of Seattle. *Lumbering* and *mining* swell the numbers.

The *seal-fisheries* of the Canadian-Pacific seaboard, the *cod-fisheries* of the great "banks" of the St. Lawrence Gulf and the continental shelf around Newfoundland, deserve mention.

## CHAPTER V.

# Traffic Lines on the North American Continent. Ports and Communication with the Outer World.

[Maps to be studied: Commercial Maps of Canada and the United States; Map of the World; Map of the North Atlantic.]

THE *river-highways* of the St. Lawrence and the Mississippi formed the natural *lines of entry* of settlers into the American continent.

The valley of the Hudson and the zig-zag valleys of the Alleghany ranges offered access to the interior for New England settlers. The *rich resources* of the Ohio valley made it a line of advance.

The great inland chain of fresh-water lakes, seas in dimensions, carried the St. Lawrence highway into the heart of the continent where all three lines of access converge.

The *Mississippi*, *Ohio* and *St. Lawrence* rivers, therefore, were the natural determining factors of development, and their valleys retain their original importance as traffic lines, because of their fertility and resources.

The discovery of *gold* in the distant Rockies, the agricultural possibilities of the *prairie-lands*, and later, the development of *fruit-farms* on the Pacific coastlands, as well as the possibilities of traffic with newly-developing lands across the Pacific, led to the gradual extension westward of the main lines of trade and intercourse.

Then followed the opening of *lateral* lines, in Canada to the North and in the United States to the fertile coastal plains of the Mexican Gulf and the Atlantic southern states.

**Railways.**—In Canada, lateral extensions of the Canadian Pacific trunk-system are few; the frozen north offers few temptations to advance. Sooner or later, the ports of the Hudson Bay must link up with Winnipeg. The gradual advance northward on the prairie-lands of the "*rain-shadow*" *region* is leading to branches which reach the *navigable* Saskatchewan river. One of these forking, rather than branching, from the main line of the Canadian Pacific Railway at Winnipeg, crosses the prairies in a somewhat higher latitude, and is destined to be carried through the new mining regions of America just north of the older Cariboo gold-mines, to terminate eventually at Fort Simpson, whose harbour opens out by the Dixon Entrance to the Pacific, and is within easy access of the *coal* on Queen Charlotte Island.

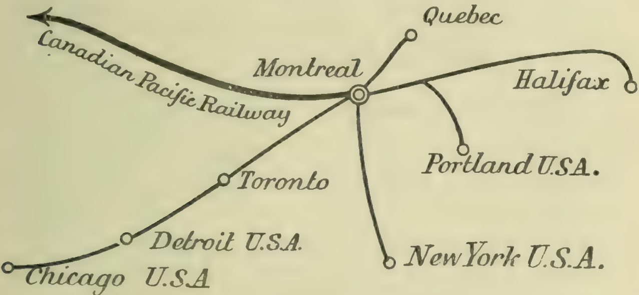


FIG. 16.—TRAFFIC LINES AROUND MONTREAL.

In the United States, railways have been enormously developed, until, east of the Mississippi, the country is covered with a complex system of lines. West of the Mississippi, the trunk lines strike along tributary *valleys* and over *passes* on the Rocky cordillera to the Pacific termini.

**Canadian Railways.**—The *foci of trade*, and therefore the centres of communication in Canada, are Montreal, Winnipeg and Vancouver. Connecting these three centres is the transcontinental system of the Canadian Pacific Railway. From Montreal. trunk lines radiate along every valley. The C.P.R. follows the Ottawa Valley and the northern side of the Great Lakes.

The principal railway of the St. Lawrence Valley, the GRAND TRUNK LINE, links Chicago and Detroit, great cities of the Union, with the Canadian lake and river foci of Toronto, Montreal and Quebec, hugging the northern bank all the way. A line to Fort Simpson is proposed.

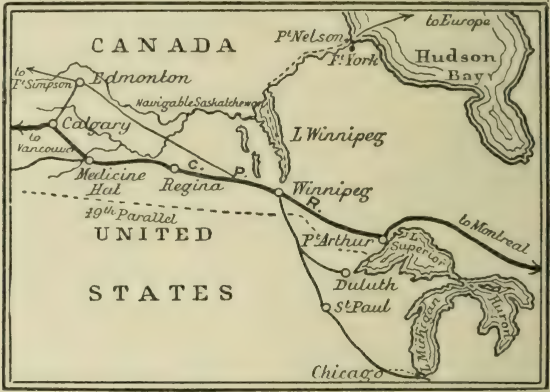


FIG. 17.—TRAFFIC LINES AROUND WINNIPEG.

The Hudson *Valley* and the Champlain *depression* afford easy passage for railway communication with New York, thus bringing the greatest emporium of each of the countries into touch.

The *International Railway* continues the trend of the C.P.R. as far as the Atlantic seaboard.

Winnipeg is the *mid-country focus* of traffic and industry in Canada. The trunk line follows the trend of the early settlers, and therefore the line of most cultivation and population. A new line strikes N.W. to the newer farms of the Saskatchewan basin. Both lines have connection with Lake Winnipeg, and before long the Nelson river valley may be expected to afford a new outlet for the grain, fur and timber exports of the interior. Fort York is considerably nearer Liverpool than either Montreal or New York. To appreciate this, the student must *refer to a globe*, and so correct the erroneous impression conveyed by a Mercator's map. Ice hampers the Bay, however, to as great an extent as it does the White Sea of Russia and its port of Archangel. Climatic conditions are more extreme than in the Baltic.

The Canadian Pacific Railway takes advantage of *two passes* to gain access to *gold-bearing valleys*—the more northerly *Kamloops* and the more southerly *Kootenay*—and then converges on Vancouver.

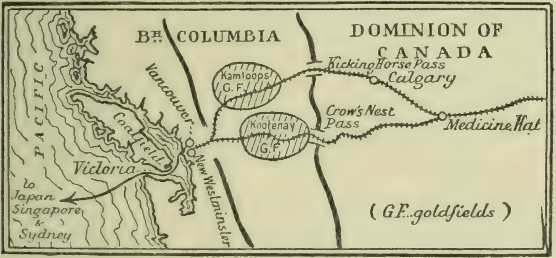


FIG. 18.—THE CANADIAN PACIFIC RAILWAY IN THE ROCKIES.

The extension of the new line to Fort Simpson will tap the gold districts of *Cariboo* and *Omenica*. North of Fort Simpson and the Dixon Sound, the fiord-like coast with its "Skerry-Fence" is in possession of the United States.

**Trunk Lines of the United States.**—The United States, with twelve times the population of the Canadian Dominion, require proportionately more railways, and the country between the Mississippi water-highway and the Atlantic, and between the Great Lakes and the Gulf of Mexico is covered with a maze of railway systems.

From these it is possible to extricate the main E.-W. *trunk-lines* running from *New York* on the east to *San Francisco* on the west.

The most northerly of these systems links *New York*, viâ the mining and smelting centre of *Pittsburg*, with *Chicago*, the focus of Michigan population and industry. It crosses the wheat and maize farms of *Minnesota* around *St. Paul*, and then, before crossing the silver and lead mining district of *Butte* in the Rockies, traverses the *Yellowstone Park* volcanic basin along the line of the river. It descends from the magnificent *Snake River* basaltic plateau to the seaboard of *Portland* by way of the *Columbia river*. (Fig. 19).

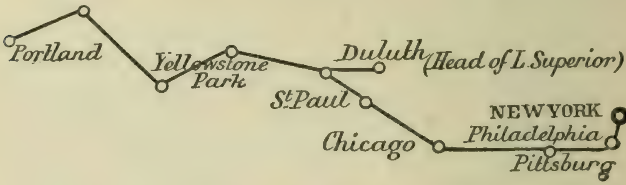


FIG. 19.—TRUNK LINE OF THE NORTHERN PACIFIC RAILWAY (U.S.A.).

A mid-country system runs very directly across the continent to terminate in San Francisco. From the railway centre of *Pittsburg* a northerly route calls at *Chicago* and then at *Omaha*, a coal and railway centre. It then climbs by way of the *Platte Valley*, north of Denver, and crosses the dreary plateau around *Salt Lake City*, prior to descending the magnificent valley of *Yosemite*, which opens out to the gap of *San Francisco*. A southern loop includes St. Louis. (Fig. 20).

The third great system of trunk lines serves to link up the great ports of the United States. It follows the Tertiary coastlands, traversing the rice, cotton and tobacco-growing southern states and calling at *Richmond* (the tobacco port), *Savannah*, *New Orleans* and *Galveston* (cotton ports). It then takes advantage of the Rio Grande valley, keeping north of the frontier, and reaches the Pacific at *Los Angeles*. (Fig. 21).

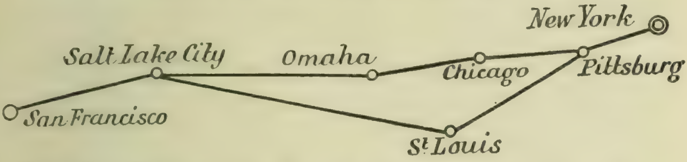


Fig. 20.—Trunk Lines of the Central Pacific Railroad.

A trunk line follows the fertile trough of California, parallel to the coast, to *Portland* and *Vancouver*.

An inner line traverses the tobacco belt, and calls at the newly-developed iron centre of *Alabama*, on its way to *Dallas*, the agricultural focus of Texas.

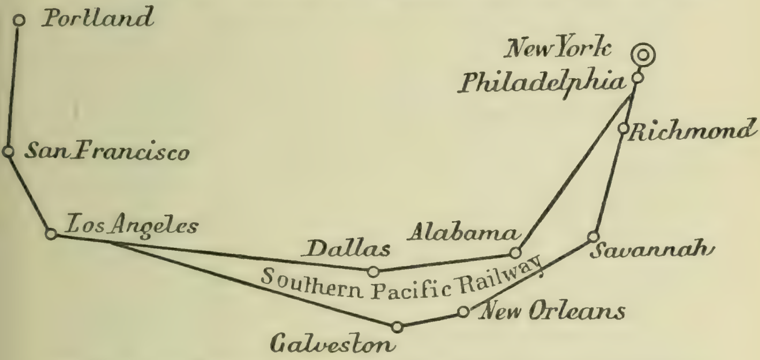


Fig. 21.—The Trunk Lines which Follow the Coastlands.

**River Communication in the United States.**—The *continental interior* is well suited to the development of great rivers; low angle of slope over a broad basin favours deep and ramifying streams, so that no district is far from a navigable river.

The rivers from the Rockies are loaded with sediment derived from the soft Secondary and Tertiary strata on their flanks. The result is that, below Cairo, the Mississippi, where its current is slow, is filling up its bed by deposition, and so raising it above the surrounding country. This is necessitating *dykes*, to protect the low-lying lands on either side. Slow rate of flow, together with enormous and constant volume of water, have made the Mississippi one of the world's chief river-highways. Many of its tributaries are nearly as important as the main stream; the Ohio should be mentioned particularly.

Specially-built river-steamers can reach the Tennessee tobacco plantations. The Ohio is navigable to *Pittsburg* *St. Paul* can be reached on the Mississippi. The Missouri is navigable almost to its source.

Even the rivers of the coastal plain give navigable access to the foot of the mountains.

**The Water-ways of Canada.**—The St. Lawrence is the great water-way of Canada. Filtered by lakes, it requires no dykes. On the other hand, it is at a disadvantage in opening into a gulf which *freezes for twelve or thirteen weeks* in the year. Rapids between one lake and another in the chain, and especially the *Niagara Falls*, further hamper its usefulness. Canalisation has largely overcome these difficulties.

The *Welland Canal* avoids the Niagara Falls and Rapids.

The *Rideau Canal*, using the river and lake of the same name, links the Ottawa with Kingston, on Lake Ontario.

The *Sault St. Marie* rapids are overcome by a pair of canals—the "*Soo*" *Canals*—one on either side of the channel, which is also the frontier. It is said that the yearly tonnage of ships using these canals exceeds that of the ships using the Suez Canal. The Great Lakes offer navigation on the scale of an inland sea; one may sail on Lake Superior for two or three days without seeing land, and may encounter storms equal to those met with at sea.

*Duluth* is the head of navigation, and belongs to the United States.

*Port Arthur* is the terminus of Canadian traffic, and is conveniently served by the C.P.R.

*Chicago* is the chief port on Lake Michigan. *Detroit* is a busy mining centre and port on the small lake St. Clair. Both are on the United States side of the frontier.

The States possess *Cleveland* and *Buffalo*, oil, coal and iron exporting towns on Lake Erie.

Canada has *Toronto* and *Kingston*, foci of industry for the province of Ontario, on the lake of that name.

*Montreal* is the great emporium and sea-port. *Quebec*, further down the estuary, is but one-fourth the size.

When ice closes the river, the open ports of *Halifax* (Canada) and *Portland* (U.S.A.), joined to Montreal by rail, are used as winter outlets.

*St. Louis* and *Memphis* are the chief river ports on the Mississippi; *Louisville* stands on the Ohio tributary. These ports gather up the wheat, hay, maize and meat exports of the great Mississippi basin, and the tobacco of the Kentucky limestone lands.

*New Orleans*, on the digitate delta, is the gate of the basin and the chief port on the Gulf of Mexico, gathering up all its different products.

*Galveston* ships cotton and the live stock of Dallas.

*Mobile* is the outlet of the Alabama iron district and shares in cotton export.

**The Atlantic Ports of the States.**—The ports on the Atlantic seaboard of the United States are conveniently divisible into two groups :—

(1) Ports of the New England States—Portland, Boston, New York, Philadelphia, Baltimore.

(2) Ports of the Southern States—Richmond, Charleston, Savannah.

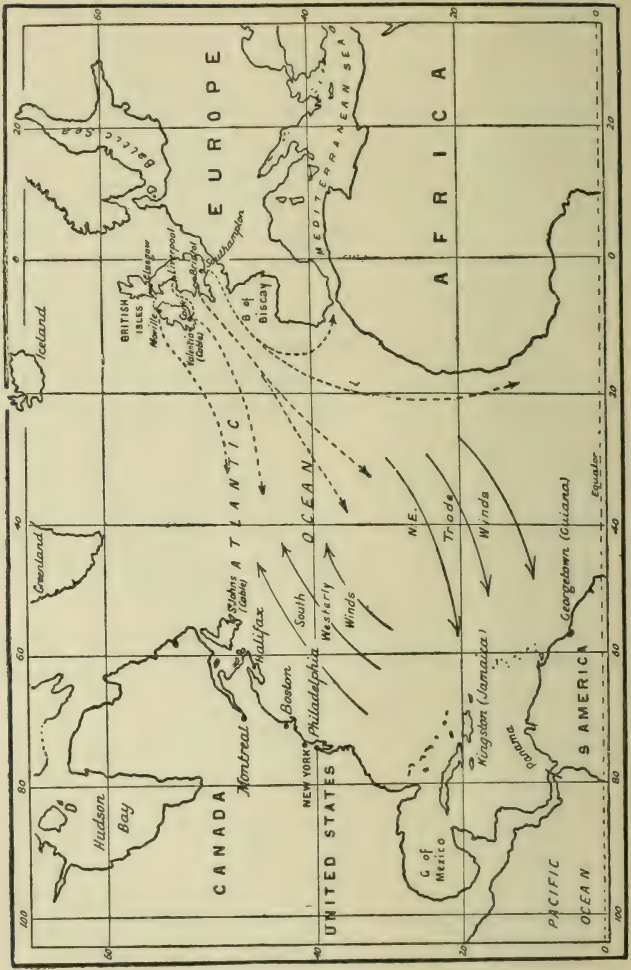


FIG. 22.—MAP OF BRITISH PORTS FACING THE ATLANTIC.*

* *Students should insert additional names.*

(1) THE PORTS OF THE NEW ENGLAND STATES.—*Portland* owes its importance very largely to the fact that it is the nearest ice-free port to the St. Lawrence valley.

*Boston*, the oldest port, founded by the Pilgrim Fathers (1620), is an important calling-place for many trans-Atlantic vessels. It is the gate of the busy industrial state of Massachussetts.

*New York* owes its origin to the Dutch Settlement of New Amsterdam (1664). It is second only to London among the cities of the world. The metropolis extends along the banks of the three channels which meet—the Hudson River, Long Island Sound and the Narrows. The focus of American life, it is engaged in general export and import.

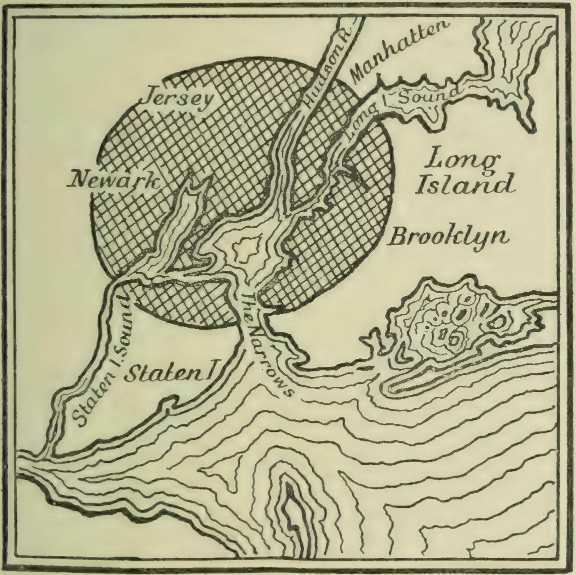


FIG. 23.—SITE OF NEW YORK.

*Philadelphia* ranks next in importance to New York. It stands at the head of the Delaware estuary, conveniently placed to serve as the outlet of the anthracite, oil and steel of the Pittsburg area. It has grown to twice the size of Liverpool.

*Baltimore*, standing at the upper end of the long fiord-like Chesapeake Bay, into which the Potomac flows, is another port within easy access of Pittsburg.

(2) THE PORTS OF THE SOUTHERN STATES.—South of Chesapeake Bay begin the tobacco plantations and agricultural lands of the southern states.

Virginia exports its tobacco, both in leaf and manufactured, from *Richmond* and *Norfolk*.

The chief outlets of North and South Carolina are *Wilmington* and *Charleston*.

*Savannah*, whose river forms a state-boundary, is the chief cotton-outlet on the Atlantic.

**Pacific Outlets.—Canada and the States.**—On the Pacific, Canada has the harbours which group around *Vancouver* at the terminus of the C.P.R.

The States have *Portland* and *Seattle* in the north, *San Francisco* in a middle position, and *Los Angeles* near the southern frontier.

*Vancouver* owes its prosperity to several factors. The gold-bearing valleys converge on it. The trunk line of Canada ends there. A fertile and fruitful coastal strip runs to the north, and excellent coal occurs in the off-lying islands. It is Canada's gate to the Pacific. The S.E. corner of Vancouver Island is occupied by the harbours of Esquimault and Victoria.

Puget Sound, on which *Seattle* stands, opens out into the same channel. Trade here is similar to that of Vancouver; the export of timber, canned-salmon and metal-ore engages the inhabitants. *Portland* is the outlet for Columbia river salmon.

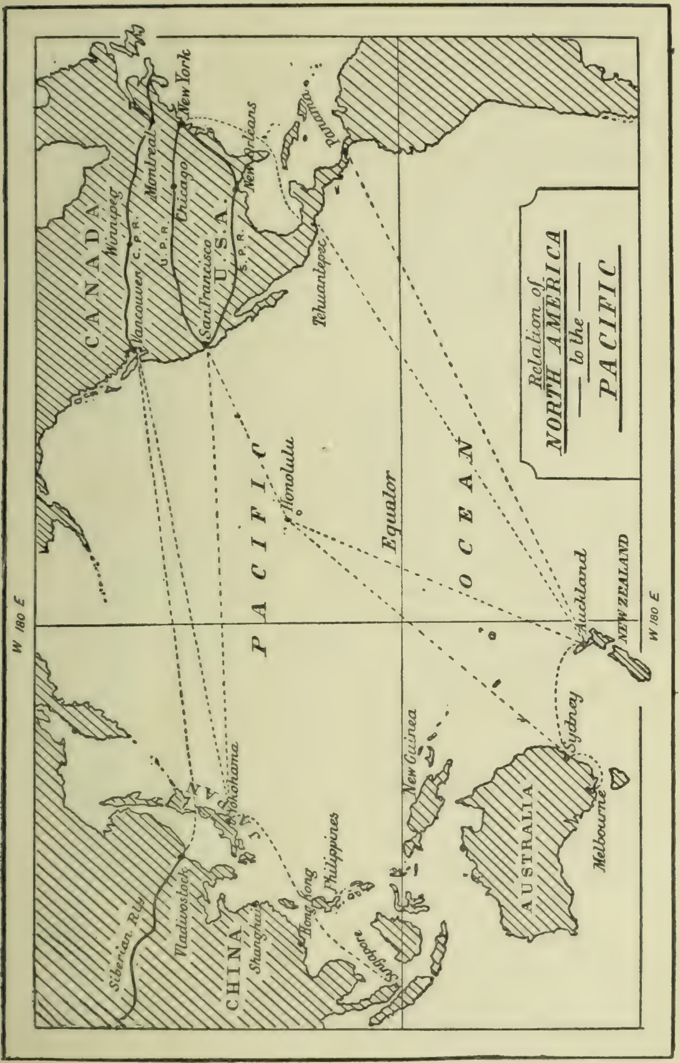


FIG. 24.—THE TRANS-PACIFIC TRADE ROUTES.

*San Francisco* is to the States what Vancouver is to Canada. It is not so favoured in respect of coal. Its greater size is due to the convergence of many traffic-lines on its harbour. It commands the Pacific trade between America, Japan and Australia. Earthquakes point to the unsettled condition of the mountain axes along this coast. *Los Angeles* is of comparatively little importance.

**Table of Populations** (for reference only) :—

[U.S.A. = United States. C. = Canada. p. = port. r.p. = river-port. Towns in the British Isles are given in italics, for comparison.]

| | | |
|---|---|---|
| *London* | 4,500,000 | |
| New York | 3,500,000 | p. U.S.A. |
| Chicago | 1,700,000 | r.p. U.S.A. |
| Philadelphia | 1,300,000 | p. U.S.A. |
| *Glasgow* | 760,000 | |
| *Liverpool* | 690.000 | |
| St. Louis | 580,000 | r.p. U.S.A. |
| Boston | 560,000 | p. U.S.A. |
| *Manchester* | 550,000 | |
| *Birmingham* | 520,000 | |
| Baltimore | 500,000 | p. U.S.A. |
| *Leeds* | 430,000 | |
| Cleveland | 380,000 | r.p. U.S.A. |
| Buffalo | 350,000 | r.p. U.S.A. |
| San Francisco | 350,000 | p. U.S.A. |
| Cincinnati | 330,000 | U.S.A. |
| Pittsburg | 320,000 | U.S.A. |
| *Bradford* | 280,000 | |
| Montreal | 270,000 | p. C. |
| *Newcastle-on-Tyne* | 220,000 | |
| Toronto | 210.000 | r.p. C. |

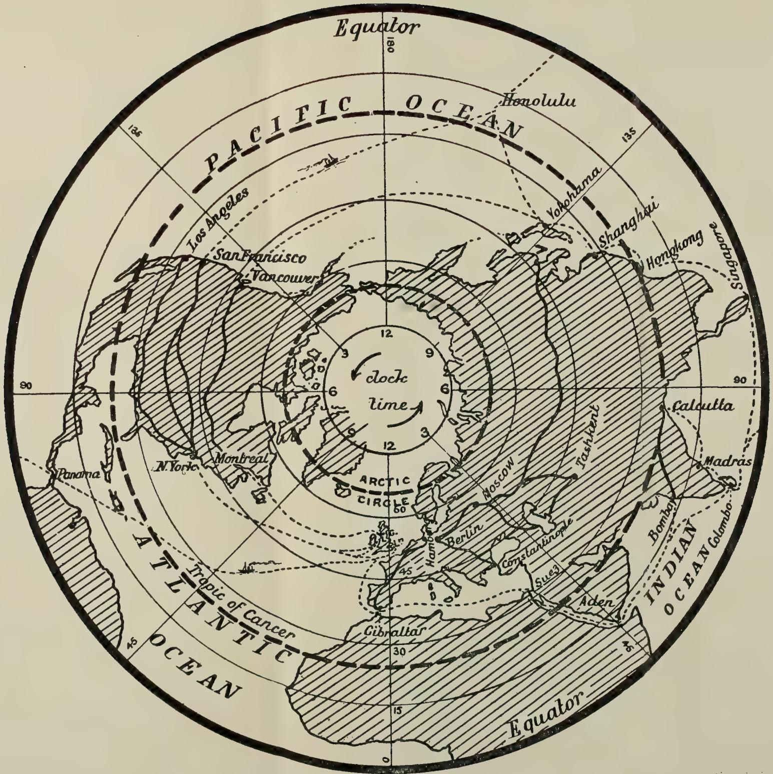


Fig. 25.—The Zone of the World's Chief Traffic Lines.
[Between the dotted circles].

# PART II.

## A Series of Nine Sections, giving Local Geography and Materials for the building of Sketch Maps.

The arrangement necessitates some repetition, but this is an advantage, for the facts now appear in their Local rather than in their General setting.

# PART II.

# THE DOMINION OF CANADA.

## I.—The St. Lawrence and the Great Lakes.

Average Latitude 45° N. Longitude 72° W.

Approximate Co-ordinates of—

79½° W.
Toronto: ┼ 43¾° N.

73½° W.
Montreal: ┼ 45½° N.

First in order of colonisation and nearest to the European continent, the basin of the St. Lawrence is the most important area of the Dominion. Moreover, it lies in close contiguity to the New England States, so far the busiest and most prosperous of the states of the Union.

The basin may conveniently be divided into *three sections*, deserving separate treatment:—

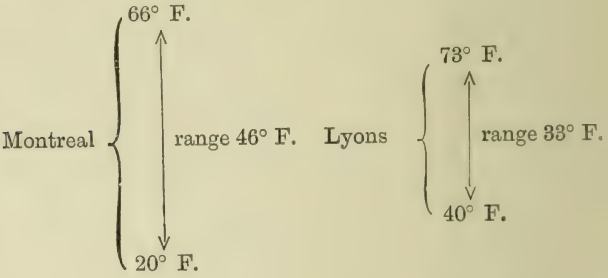
1. The Gulf Provinces.
2. The Lower St. Lawrence and Quebec.
3. The Great Lakes and Ontario.

The course of the St. Lawrence is determined by the *ancient trough* running parallel to the folds of the New England ranges, and let down between them and the crystalline plateau of Quebec. The valley leaves little room for the development of tributaries. The *Saguenay* and the *Ottawa* from the northern divide, and the *Richelieu* from *Lake Champlain*, in New York State, are the most important.

The trough expands upwards into the *plateau-basin* of the Lakes, and outwards into the wide, shallow *gulf.*

The *average latitude* is 10° further south than that of the British Isles, but the mean annual temperature is only about the same (45° F.). Summers are warmer and winters decidedly colder than in Great Britain; the estuary is *frozen for about four months* every winter. The climatic type, and, indeed, the general physical characteristics resemble those of the *Baltic Sea*, Newfoundland and Cape Breton Island making the gulf *an inland sea.*

*Montreal* is as far south as Lyons, and about equidistant from the sea; a comparison of summer and winter temperatures is therefore instructive.



The more *extreme climate* of Montreal is due to the fact that its winter winds blow from the north-west over a continent, and its summer winds blow from the south-west over another stretch of the North American land-mass. (*See* Figs. 13 and 14).

The tendency of the *warm oceanic drift* of the Atlantic is *away from* the St. Lawrence Gulf. On the other hand, the prevalent winds across France—again from the west, whether N.W. or S.W., or due W.—have blown across the Atlantic, and are, as a result, more equable in character, whilst at the same time the French coast benefits by the warm drift of the Atlantic laving its shores.

The valleys of the crystalline lake-plateau north of the trough are filled with *timber-trees*; the slopes of the folded ranges south of the trough are especially suited to *dairy-farming*; the lake-peninsula of Ontario, the most southerly region of Canada (Toronto is in the latitude of Marseilles) is well adapted to *fruit-farms*; the northern shores of Superior and Huron promise to develop into a rich *mining industrial* area, *copper*, *iron* and *nickel* occurring in abundance.

*Montreal* is the focus of industry and the terminus of railway and shipping traffic; it stands midway between north and south, east and west—between the French-Canadian Quebec and the provinces of the Gulf on the east, and the thoroughly British province of Ontario on the west.

*Quebec* is strongly French in character, having changed little since its capture by Wolfe in 1759. It remains the capital of the French Canadians and the principal seat of the *lumber* industry.

*Toronto* is the most British of the St. Lawrence cities, and the centre of the fruit farm-lands. *Sudbury* on the C.P.R. and *Sault St. Marie* on the Lake system have yet to decide which shall be the metropolis of the mining industries.

We may now consider the three sections more in detail.

(*a*) **The Gulf Provinces.**—Under this title we include *Newfoundland*, *Cape Breton Island*, *Nova Scotia*, *New Brunswick* and *Prince Edward Island.*

**Newfoundland**, it should be remembered, has its own Government, independent of the Dominion.

Physically, *Nova Scotia*, *Cape Breton Island* and *Newfoundland*, the Atlantic border provinces, are precisely similar. They are built of folded Primary rocks, which continue northward the *true mountain-structure* of the American Appalachian ranges. *Ribbon-lakes* occur in the hollows of the folds and *sea-fiords* creep up into the interior from the coast.

The slopes are covered with *timber* and lumbering is the chief occupation for landsmen.

The three provinces, as, indeed, the whole of the gulf region, rest on a *submerged platform*, precisely as do the British Isles. The result is that the shallow seas of the Gulf of the St. Lawrence are the home of great *fisheries*.

It was the fishing facilities that first drew French fishermen to these coasts. *Cod fisheries* are the most important and thousands are engaged in the industry. From some of the ports *sealing and whaling expeditions* set out to the North Atlantic. Though the French lost Canada in 1763, they still retain the island of *Miquelon* and *St. Pierre* on the banks south of Newfoundland, together with fishing rights between Cape St. John and Cape Ray.

**Newfoundland** has a more rigorous climate than Nova Scotia. It is exposed to the icy *Labrador Current*, and the *fogs* produced by the sudden meeting of cold air over the Labrador Current with the warm moist air above the *Atlantic oceanic drift*—off the promontory of Cape Race—make navigation dangerous. *St. John's*, the capital of the island, has a fine harbour, and is little more than three days' sail from Cork. Steamers, however, make little use of it, for in summer they can get through the *Strait of Belle Isle* to the St. Lawrence ports, and in winter, when the Gulf is ice-filled, they use *Halifax* or *Portland*, both of which are connected by trunk lines with Montreal.

**Cape Breton Island** is nearly severed in two by inlets, and the peninsula of **Nova Scotia** is nearly an island (pen-insula) owing to the penetration of the funnel-shaped *Bay of Fundy* whose *tidal bore* is the highest known, sometimes rising as much as 70 feet. *Sydney* is the capital of the island and *Halifax* the capital of the peninsula.

Halifax is now an important terminus, and has a still greater future in store; in addition to being the real *Atlantic* *terminus* of Canadian railways, it is developing *iron* industries by aid of *coal* from the mines of Pictou on the isthmus. An outlying patch of coal occurs on the southern coast of Cape Breton Island.

**New Brunswick and Prince Edward Island** occupy the basin between the *Gaspé promontory* and the *Nova Scotia* mountain system. The mainland province slopes down from the sandstone range of the Gaspé to the *Bay of Fundy* (never frozen) on the south and the land-locked, winter-closed *Gulf of the St. Lawrence* on the north.

Detached from the mainland by the *Northumberland Strait* is the horizontally-bedded New Red Sandstone island of *Prince Edward.*

The *St. John*, the only river of importance in the basin, drains to the open Bay of Fundy. *Fredericton*, the capital of New Brunswick, stands on the river, and *St. John* is the outlet-port.

A *coalfield* occupies the northern coast of the province, extending from *Bathurst* as far as *Cape Breton Island.* It stretches into the interior as far as the *St. John River.* A railway traverses the field, and links its mining centres with the markets of *Halifax*, *Quebec* and *Montreal.*

**Prince Edward Island,** of similar physical structure to the Vale of York or the Basin of the Trent, has been called the "Garden of Canada." *Charlottetown*, on the Northumberland Strait, is the capital.

Apart from *coal-mining* and its attendant industries, the province and its off-lying island are given over to *dairy-farming.* French peasants outnumber British by at least five to one.

(*b*) **The Lower St. Lawrence and the Province of Quebec.**— A student of the map of Canada cannot fail to notice the *use of physical features as provincial and political boundaries.*

*Rivers* are more often used than *mountain-walls*, owing to the greater definiteness of boundary afforded. Where no physical feature can serve, the use of *longitude and latitude lines* is predominant on the North American continent.

The French Canadian province of Quebec is limited on the south by the river *Ottawa*, on the west by a line of *longitude* (79½° W.) extending from the Ottawa to *James Bay*, on the north by *two streams*, draining in opposite directions—the *East Main river* to James Bay and the *Hamilton river* to the Atlantic; a line of *latitude* (45° N.) links the river-frontier of the *St. Lawrence* with the mountain-wall boundary east of the St. Lawrence trough.

The long island of *Anticosti*, obstructing the entrance to the St. Lawrence, is an unpopulated sand bank.

The large **Province of Quebec** thus lies chiefly north of the St. Lawrence extending back on the crystalline plateau as far as *James Bay* and the inhospitable lands of *Labrador* and *Ungava*, with a river and gulf frontage from *Montreal* to the *Strait of Belle Isle*. It includes the slope of the *Gaspé range* on the right bank from a point just above Montreal to the Gaspé promontory. Its area is double that of France. The lake-plateau north of the St. Lawrence is the exact counterpart of *Finland*. The average altitude is 1,200 feet; innumerable lakes fill the hollows of the crystalline rocks; parallel streams run off the edge of the plateau to join the St. Lawrence.

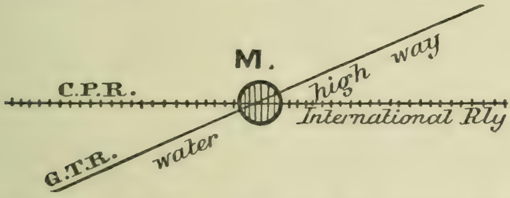
*Timber* is plentiful, and probably, as in Finland, *iron* abounds, though as yet it remains undiscovered and unworked in this eastern province of the basin. *Quebec* is the gateway of the lumber export; saw-mills and pulp-factories occur at the outlet of every lateral valley. The *Saguenay* estuary is less liable to freeze than the St. Lawrence, its waters being more brackish; it provides excellent anchorage and it has therefore been suggested to create *a new railway terminus* at the mouth of the Saguenay, the railway to cross the forest and iron-ore belt by the shortest line to Winnipeg.

The *trough from Quebec to Montreal* (and indeed to Lake Ontario) is floored with Silurian rocks (like those of Wales or Cumberland) overlain with *rich alluvium*, left by the retreat of the estuary. This horizontal floor is very productive, and is given up to mixed farming, *i.e.*, pasture, tillage and market-gardening.

*Quebec* is the historic town and mother-city of the province and the approach by steamer is magnificent. Strongly fortified, it looks down from the Heights of Abraham upon the busy river. It is the most French of any town outside France. 85 per cent. of the people being French and Roman Catholic; it is therefore the real capital of the French-Canadian who is chiefly found from Montreal to Pictou and the country of Evangeline. It was founded by the French in 1608, and captured by Wolfe in 1759.

*Three Rivers*, midway in the alluvial trough, where two lateral streams join the St. Lawrence from opposite banks, is the outlet of the *St. Maurice* valley.

*Montreal* (Mont Régal—the royal mountain), so named by the French in 1642, is built around a *volcanic plug* rising out of the *alluvial flats* of an island at the confluence of the Ottawa and the St. Lawrence. It is the largest city of the Dominion, possessing unique advantages of railway and river transit, including the St. Lawrence valley and the *Hudson depression*, leading direct and due south to *New York*. Its population numbers about a quarter of a million. The French



element again predominates, though it is necessarily the most cosmopolitan of Canadian cities.

(*c*) **The Great Lakes and Ontario.**—The irregular and extended **Province of Ontario** has the Great Lakes for its boundary on the south. Three river systems serve as political frontiers—the *Rainy* and *Pigeon* rivers and lake-chain draining to Lake Superior and the Lake of the Woods, the *English* and *Albany* chain of lakes and streams draining to Lake Winnipeg and James Bay, and the *Ottawa* finding its way to the St. Lawrence. Most of the drainage is *away from the Lakes*, for the "*Height of Land*" on the plateau runs parallel to and not far from the northern shores of *Superior* and *Huron*.

The province has lake-frontage on all the Great Lakes, except *Michigan*, which is entirely within United States territory. The fertile tract corresponds with the sedimentary rock *lake-peninsula* jutting south-west between *Lakes Huron* and *Erie-Ontario*. The crystalline plateau extends westward from Labrador and Quebec, and southward from Hudson Bay to the shores of *Lake Superior* and the Georgian arm of Lake Huron. The railway from *Parry Sound*, on *Georgian Bay*, to *Ottawa* marks off the plateau-region from the sedimentary facies. *Lake Ontario* lies in a basin of ancient clays banded with limestones (one of which is the Niagara Limestone); *Lake Erie* is held in a basin of Old Red Sandstone, the chief storehouse of *petroleum*; the fertile region corresponds with these two lake basins.

At present the population is aggregated on the lake-peninsula, enclosed by the Lakes, the Ottawa and the St. Lawrence. *Fruit-farming* is here more successful than elsewhere in Canada. Some mixed farming is added. Agriculture is specially encouraged from the State College at *Guelph*. Means of transit are plentiful. Steamers ply on the lakes and the *Canadian Pacific Railway* runs from Montreal keeping south of the "Height of Land" to touch Lake

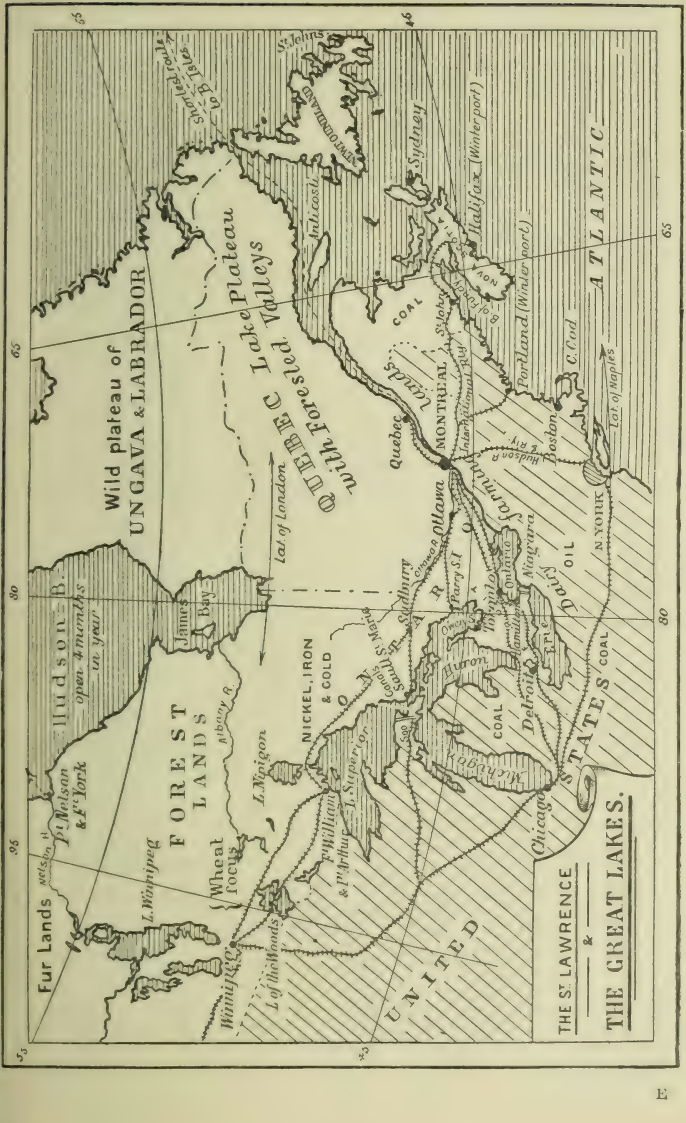


FIG. 26. -THE ST. LAWRENCE AND THE GREAT LAKES.

Superior at *Heron Bay* on its course westward across the continent. The *Grand Trunk Railway* follows the Laurentian trough to *Detroit* on the States side of the frontier, calling at *Kingston, Toronto* and *Hamilton* (all on Lake Ontario).*

Lines branch from *Ottawa*, on the C.P.R., and from *Toronto*, on Lake Ontario, to the lake ports on Huron, *Parry Sound* and *Owen Sound*, both on the Georgian Bay. Lake navigation has been greatly enhanced by the canalisation of the *Sault St. Marie* rapids and the *Niagara* bluff.

The "Soo" (pronunciation of Sault) canals, *one* on the Canadian side and *two* on the American side, together with the International Bridge, linking Canadian with States railways, across the rapids, will do much to make *Sault St. Marie* one of the most important distributing and manufacturing centres in Canada. It should rapidly out-distance *Sudbury*, which stands back from the lakes. The *Welland Canal*, across the Niagara peninsula, gives direct passage from the lakes to the St. Lawrence.

The head of lake navigation on the Canadian side is *Port Arthur*, with its neighbour *Fort William*. Here we touch upon the great *wheat-growing region*, of which Port Arthur is the eastern gate. It is instructive to contrast the climate of the plateau between the Lakes and Hudson Bay with that of the fertile peninsula around Toronto.

| | | | |
|---|---|---|---|
| Port Arthur | 66° F. Summer Isotherm.<br>10° F. Winter Isotherm. | Toronto | 73° F.<br>27° F. |
| | 56° F. range. | | 46° F. |
| Average t° | 38° F. | Average t° | 50° F. |

*Port Arthur* is in the *latitude of Paris* (average t° 52° F.); *Toronto* in the latitude of *Marseilles* (average t° 60° F.).

The *plateau* and the *plain* differ widely in nearly every way. Climate is more rigorous on the plateau, while fertility is considerably less; thus far, population depending on fertility, the peninsula has been the most densely peopled area in Canada. But the plateau is now discovered to be rich in mineral wealth. *Iron* of excellent quality, *copper-ores*, and, most remarkable of all, *nickel*, which usually accompanies copper, is here more plentiful than in any other known area. The richest area is that of *Algoma*, between the two important transit lines, the C.P.R. and the Lakes. *Sudbury* and *Sault St. Marie*, on railway and lake, are the inevitable centres of mining development. *Coal* is lacking, but easy of shipment from *Cleveland* and *Detroit*, on the States side of the Lakes. *Timber* is plentiful and available for smelting. It is therefore possible that population may shift from the overcrowded peninsula to the mining centres on the plateau.

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* N.B.—The principal towns on Lake Erie ("oil" towns) are on the States side of the lake.

*Toronto* is the largest city of the province. In the most British of Canadian provinces it is the most British of Canadian cities. It is about three-fourths the size of Montreal.

*Ottawa* is the seat of the Dominion Government; it is linked with Lake Ontario by the *Rideau Canal.*

*London* stands in the midst of the fruit farms of the fertile peninsula. The great lakes of the plateau constitute the greatest body of fresh water in the world. They recall the precisely similar great lakes of *Finland.* Lake transport is so important (wheat and minerals) that the tonnage of vessels using the "*Soo*" *Canals* in a year exceeds that of the vessels using the Suez Canal. *Parry Sound* is the lake port for Ottawa and Montreal. *Owen Sound* similarly serves Toronto; by them tourists avoid the roundabout voyage by *Detroit.* Lake-steamers of special construction can now carry wheat from Port Arthur to Manchester. From Port Arthur to the Straits of Belle Isle is about as far as from Belle Isle to Manchester.

The shores of *James Bay* are swampy and only frequented by the trapper.

## II.—The Dry Interior of the Dominion: Wheat-lands and Cattle-ranches.

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97°W.
Approximate Co-ordinates of Winnipeg: ┼ 50°N.

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The student has previously noted in Chapter II. the *chain of lakes* which runs parallel to the curve of *Hudson Bay*. Between this definite chain and the long mountain-wall of the Rockies, and extending in Canada to the *United States frontier*, we have a very marked geographical unit of the Dominion.

Whilst the belt between the chain of lakes and Hudson Bay is an exposed area of fundamental ancient crystalline rocks, rich in granite and other igneous rocks, as well as in ores of the valuable metals, and covered in many places with forests of fir and spruce, the triangular area defined for consideration in this section is covered with *loose sedimentary rocks* of Secondary down to Recent age, which lie upon the fundamental crystallines.

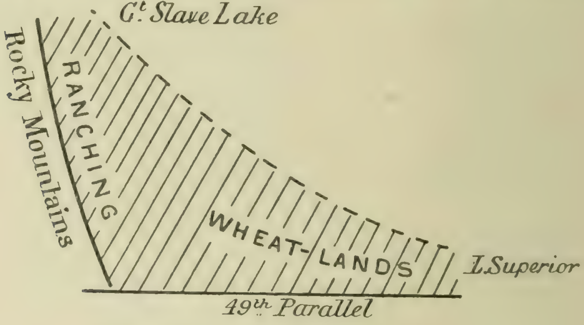

Fig. 27.—The Dry Interior.

In these rocks *mineral wealth* is scarce.* Development depends on fertility. The varied facies of Secondary and later sediments (clays, soft limestones, sands and gravels) when admixed by coalescing streams and distributed over flood plains, or on the floors of lake-basins, give rise to soils of the greatest fertility.

*Rainfall* is, however, a necessary factor to productiveness. The region outlined is the *driest* of any part of habitable Canada. More rain falls here, however, than in the great *Colorado Basin.* Thus, whilst the latter is practically desert, the *Canadian interior* is one of the richest agricultural regions on the continent. The *rainfall* averages 15 ins. a year, whilst that of Nova Scotia attains to 50 ins. a year.

In so *dry* a region one naturally expects *extremes of climate.* The July isotherm is 70° F., equal to that of *North Spain.* The January line is 0° F., or 32 degrees of frost, equal to that of *Greenland* or *Nova Zembla.* The range between summer and winter is therefore as much as 70° F. (average for the area), whereas in *Great Britain* the average range is only 20° F. Next to *Siberia*, we find here the most continental of climatic types.

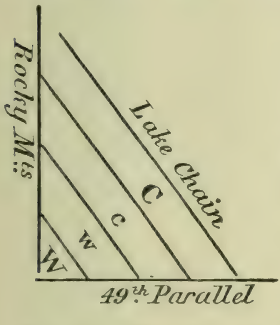

FIG. 28.—TEMPERATURE BELTS.

But the S.W. corner of the triangle is much more genial than the S.E., being nearly twenty degrees warmer in the winter. The belts of climate run *diagonally*, as shown in FIG. 28. The great heat of summer is accounted for by the *long days* and the *absence of rain.* Seventeen hours' sunshine a day is common in July, and with such a climate a *three*

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* Coal is, however, suspected *beneath* the Secondary rocks, outcropping seams having been noted along the river-channels.

*months' season* is long enough for wheat-growing. The intense winter cold harms nothing, but rather helps the soil by freezing the water which has soaked into it, and so crumbling the ingredients.

The *wheatlands* in belts C and c of FIG. 28 are becoming the granary of the Empire. *Ranching* is characteristic of the warmer belts at the foot of the Rockies. The province of **Alberta** is occupied by foot-hills, and so less suitable for the plough than the flat provinces of **Manitoba** and **Saskatchewan.**

The rivers of the region drain mostly to the *Hudson Bay*, which would be an ideal outlet but for its winter-ice.

*Port Churchill* is thirty miles nearer Liverpool than New York is, and the transit could all be made by water, so avoiding heavy freight-rates by rail.

The *Nelson River* and the *Churchill river-and-lake-system* would develop into lines of navigation; the ports at their mouth would grow into oceanic ports.

*Port Arthur* must, however, for the present, serve as the port of the productive interior. The huge grain-elevators, capable of storing 7,000,000 bushels of wheat, proclaim the port of *the Empire's granary.* The alternatives are lake-navigation or rapid transit to the wharves of *Montreal* by the C.P.R.

*Winnipeg*, 550 miles west on the railway is the *exchange* or bourse of the cornlands. In fifty years it has grown to a town of fifty thousand inhabitants.

*Brandon*, in the midst of the best wheat country, is the farmers' centre.

At *Winnipeg*, *Regina* and *Swift Current* the main line throws off tentacles to gather up the produce of the harvest. These latter branches extend further north-west along the temperature-zones as year by year fresh land is broken up by emigrants.

The line from Winnipeg has gained *Fort Churchill* by way of the *Nelson Valley.* The other lines extend to the *Sas-*

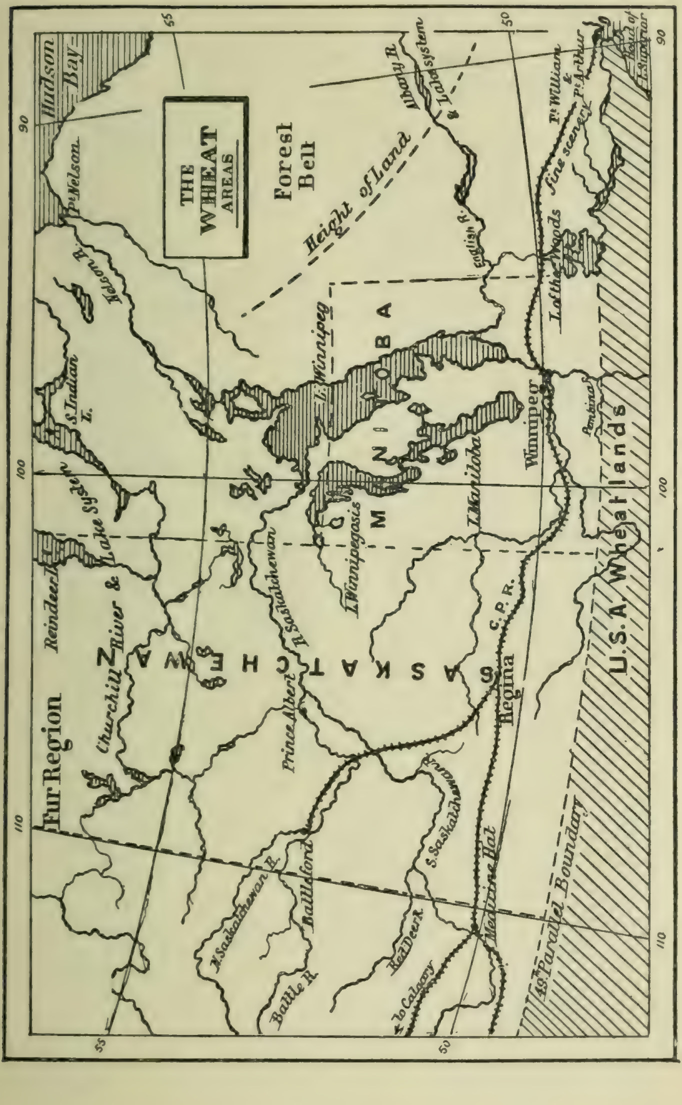

FIG. 29.—THE WHEAT AREAS.

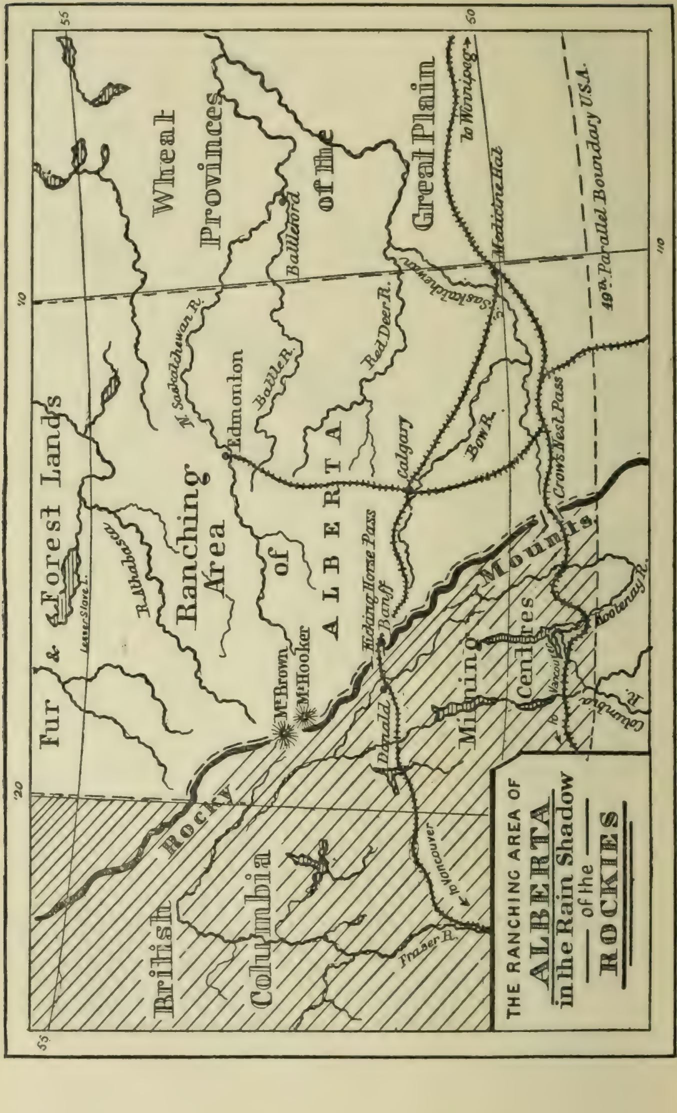

FIG. 30.—THE RANCHING AREA OF ALBERTA. (*In the* **rain-shadow** *area of the Rockies.*)

*katchewan waterway.* Both the Saskatchewan and the Churchill valleys may one day be traversed by cross-continental lines converging upon *Fort Simpson* on the *Dixon outlet* to the *Pacific*. The development waits the exploitation of *goldfields* in the Rockies and the ploughing of *wheat-lands* in Athabasca, no longer a separate district. (*See* Figs. 29 and 30).

At *Medicine Hat*, where the line forks before crossing the Rockies to Vancouver, we approach the foothills of the great range and enter the *ranching country*. Alberta is world-famed for horse and cattle-rearing.

As we have already noted, the province is warmer than the wheat territories. It is sheltered by the mountains, and in winter the cold is tempered by the *warm south-west wind*, which blows through the passes of the Rocky Mountains from the Pacific Ocean (*See* Fig. 13). Coming from the land of the Chinook Indians, this genial wind is called the *Chinook*. As a result of this wind, snow seldom stays on the ground for more than three days at a time.

The country is well-watered by *glacier-fed* streams from the Rocky Mountains. Some of the giants of the range overlook this province (*See* Fig. 30). The main line of the Canadian Pacific Railway negotiates the Rockies by means of the *Kicking Horse Pass*. It enters at *Banff*, a tourist centre with a National park, and emerges at *Donald*, on the Columbian side and at the foot of the towering peak Sir Donald.

*Calgary* is the ranchers' capital and the railway focus of Alberta.

*Fort McLeod*, due south, on the minor fork of the C.P.R. and at its intersection with the *South Saskatchewan* river, is another transit-centre.

The *minor fork* of the railway crosses into British Columbia by way of the *Crow's Nest Pass*, in the *Kootenay* district.

*Edmonton* is the northern limit of the ranchers' railway; he calls it his station for the North Pole, being the most northerly railway station in the Dominion. Nevertheless, it is only in the latitude of Leeds.

## III.—The Canadian Rockies and the Pacific Seaboard. B.C. 1907.

123° W.
APPROXIMATE CO-ORDINATES OF VANCOUVER CITY: ┼ 49½° N.

THE *Rocky Mountains of Canada* are more truly a *complex folded system* than the Rockies of the United States. The block-structure of the Colorado country, enclosed between the inner and outer mountain walls of the States, is practically absent in British Columbia. The cordillera of the Canadian system is a complex of crystalline, sedimentary and igneous rocks crumpled into folds of immense altitude, denudation not having had time to wear down the system, as it has reduced the folded ranges of the Appalachian system on the Atlantic seaboard. The cordillera is young, geologically speaking; hence the absence of smooth, rounded summits and axes—Nature has yet to rub the angles down. *British Columbia* is therefore a country of lofty *peaks* (Eng.), *aiguilles* (Fr.), *horns* (Ger.), outrivalling the Alps in grandeur and gloom. The cordillera approaches the coast and leaves *no room for a coastal plain*; the formation of lateral valleys and the sinking of the seaboard has given rise to a *fiord-cleft coast*, with a *skerry-fence* of islands precisely similar to the rock-bound shores of Scandinavia.

**Types of Physical Features:—**

(*a*) *Parallel ranges*, with *trough valleys.*

(*b*) Only the *highest range* uncleft by lateral valleys—the few passes (*e.g.*, those used by C.P.R.) are the exceptions.

(*c*) Drainage to coast from culmination gives *lateral* valleys by cutting through gaps in the lower ranges.

(*d*) The *fiords* and *sounds* are sea-filled valleys, their zigzag form being due to the coalescence of longitudinal and lateral valleys.

The ranges of the cordillera present their flanks almost *normally* to the rain-bearing winds from the Pacific. The outer seaboard range, called the *Cascade Range* from the number of streams which fall over its ledges on their swift course to the sea, is of sufficient altitude to lead to *intense precipitation*, with a result that the seaward slope is the rainiest belt in Canada, or, indeed, in the whole continent outside the tropics. The winds have been considerably tapped before they reach the main range, so that in a short distance of 100 miles the rainfall lowers from 80 ins. on the *west slope* of the Cascade Mountains to 20 ins. on the *inward slope* on the "rain-shadow" side of the range.

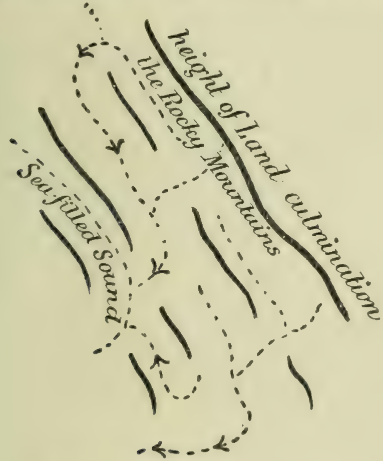

FIG. 31.—ZIG-ZAG VALLEYS.

The *gap at Vancouver*, by which the waters of the *Fraser* empty into the *Georgian Strait* and the outlet Strait of *Juan de Fuca*, allows the rain winds access to the valley, with the result that this basin is a *local area of exceptional rainfall* (average 40 ins.).

The interior of British Columbia is thus not so rainy as is generally supposed; indeed, the *Kootenay region* is called the "*dry*" *region* of the province, and *fruit-farming* has been suggested.

British Columbia is as yet largely undeveloped, but her resources must before long lead to vast strides in colonisation. As far north as *Dixon Entrance* the coast is in the hands of Canada, and the *hinterland* is rich in *timber* and *minerals.* The estuaries abound in *salmon.* The off-lying islands have valuable deposits of *coal* (of Secondary age).

The Strait of Juan de Fuca and the Dixon Sound afford excellent anchorage and are never frozen. The former is already Canada's "sunset doorway of the Dominion," while the latter promises to rival the Vancouver passage when the proposed trunk lines across the northern wheat-lands cross the Rockies to reach *Fort Simpson.*

The summer and winter isotherms, which intersect at *Liverpool*, also intersect at *Vancouver*; such a fact reveals the average character of the climate in the *south* of the province and points a striking contrast to the climate of *Winnipeg.*

| | | | | | |
|---|---|---|---|---|---|
| Vancouver | Summer | 60° F. | Winnipeg | Summer | 70° F. |
| | Winter | 40° F. | | Winter | 0° F. |
| | Range | 20° F. | | Range | 70° F. |

The *difference in rainfall* will explain the *difference in range of temperature* of the two towns.

The Rockies are the only region where a *mountain flora* occurs.

The slopes of the ranges are clad in forests of *Douglas spruce* and *white cedar.*

The middle ranges of the Cordillera, occupying the catchment area of the *Fraser* and *Kootenay* rivers, have many igneous rocks, and are rich in *mineral-ores*; *gold* and *copper* are the principal metals; *silver-lead* ores also occur.

The *Nanaimo coalfield*, on the inner slope of the island of *Vancouver*, and the similarly placed coalfield of the *Queen Charlotte Islands*, await development.

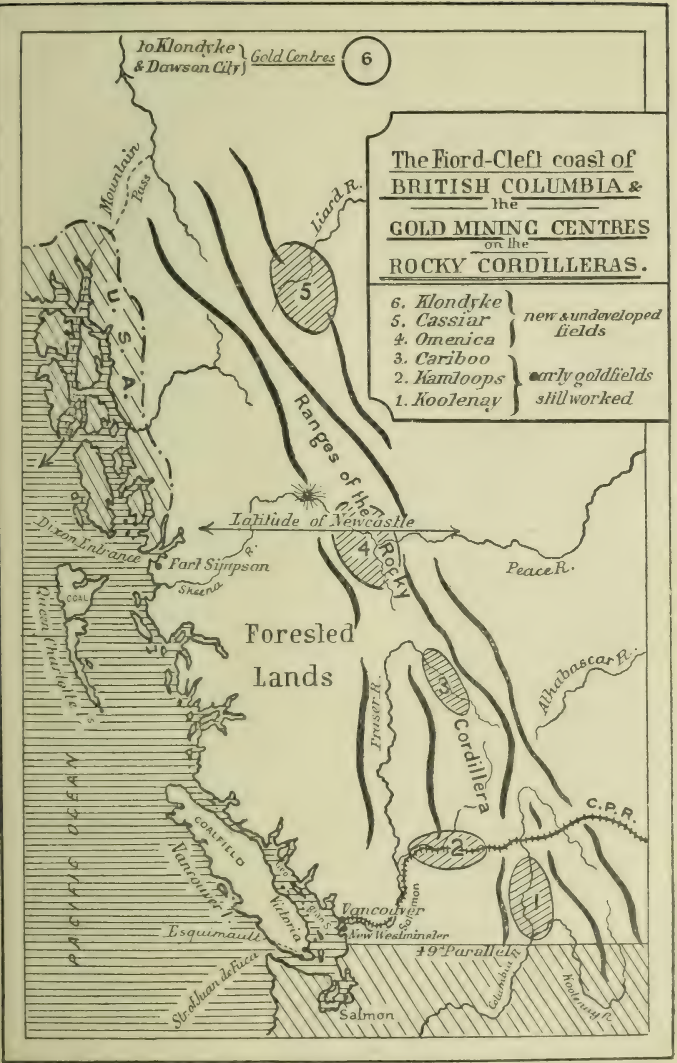

FIG. 32.—THE FIORD-CLEFT COAST OF BRITISH COLUMBIA AND THE GOLD-MINING CENTRES ON THE ROCKY CORDILLERAS.

*Timber* is available for building, pulp-making and smelting industries.

*Salmon fisheries* have led to 50 canning centres on the Fraser river.

*Fort Simpson* may be expected to develop, not only as a commercial gateway, but also as a base for *whale and seal fisheries*, the coast north of the Dixon Entrance being the chief home of the valuable fur-bearing seal.

*Placer-gold*, in the sands of the *Fraser River*, first attracted prospectors and miners to British Columbia. The quartz reefs in the hill-sources are now being quarried, and the ores crushed.

*Copper-ores* have been discovered to be plentiful, and are being worked by American plant and American miners in the Kootenay region, on the southern fork of the C.P.R.

*Nelson* and *Rossland* are important centres. *West Robson* is the centre of lake and railway transit.

The ribbon-like *Arrow Lakes* are expansions of the *Columbia River* in these mining valleys.

*Arrowhead* is connected by rail with the main fork of the railway at *Revelstoke.*

The *Kamloops goldfield* is in the valley of the *Thompson* affluent of the Fraser. The *Cariboo goldfield* is at the source of the main river.

The *Omineca goldfield* is in the lake-country around the head streams of the *Skeena*. Its inevitable outlet is *Fort Simpson*, which must also serve the *Cassiar gold-mines*, on the northern (60° N. lat.) frontier of the province.

*Vancouver City*, at the mouth of the Fraser (whose quota to the world's production is made up of timber, salmon and gold), at the western terminus of the Dominion's highway, with splendid anchorage and a gateway to the broad Pacific, is the focus of British Columbia. *New Westminster*, *Port Victoria* (the out-port and rival of Vancouver) and *Esquimalt* (the head-quarters of a British squadron), all join in the activities of import and export.

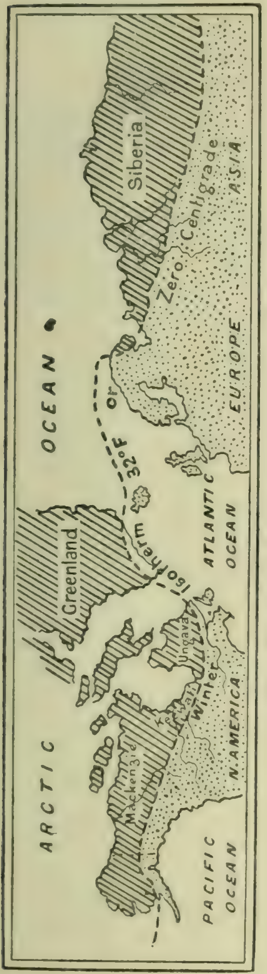

FIG. 33.—THE GEOGRAPHICAL ARCTIC ZONE.

The *goldfields of Yukon*, around the sources of the mighty Alaskan river of the same name, are within British territory. *Dawson City*, a town of shanties, with a summer climate as warm as that of *Leeds* and a winter temperature little colder than that of *Winnipeg*, is the centre of the *Klondyke* mining operations. The river is navigable for 1000 miles, but *Dyea* is the natural outlet of the region. It is a United States station. Passes over the Rocky Mountains afford access from port to goldfield.

## IV.—The Frozen North.

THERE remains to be considered the *frozen belt* of Northern Canada. A land of *mighty rivers* and *innumerable lakes*, its drainage is all to the *Arctic Seas*. Frost-bound for the greater part of the year, *poor in rainfall*, it offers no temptation to the agricultural settler. The coastal belt is covered with *tundras*, frozen swamps, which, under the heat of the long summer days (the Arctic Circle bisects the belt), have a surface of mire less desirable than the hard winter soil.

*Trapping* for furs from the elk, the moose and the beaver is the only inducement to penetrate this region.

*Timber* is available ; minerals remain unexplored.

*Fort Churchill* is the rendezvous of fur traders. Red Indians and Esquimaux here foregather to barter with the European trader.

The great bay, named after its discoverer *Hudson*, is twice as large as the *Black Sea.* But it falls entirely within the Arctic belt. It affords the supreme *climatic contrast* to the other great bay of the North American Continent—the *Gulf of Mexico.*

Fig. 33 suggests many comparisons with *Arctic Siberia.*

# THE UNITED STATES.

## I.—The Atlantic States.

APPROXIMATE CO-ORDINATES OF—

74°W.
NEW YORK: —|— 41°N.

80°W.
PITTSBURG: —|—41°N.

80°W.
CHARLESTON: —|— 33° N.

THE original *British colonies*, thirteen in number, which afterwards united to form the independent republic of the United States, were all situated along the Atlantic seaboard. To the north the parallel ancient ranges of the Appalachian system approach nearer and nearer to the sea, eventually affording sea-filled valleys and island-ranges, but no coastal plain. To the south the ranges extend obliquely back from the coast, leaving a broadening coastal plain, which merges with that of the Gulf of Mexico. Climate amid the ranges of the north suited the British colonist better than the warmer, damper climate on the plain to the south.

The French were in possession of the St. Lawrence, and had pushed well into the continental interior *viâ* the Mississippi when Raleigh planted the first colony of *Virginia*, in 1584, naming it in honour of Queen Elizabeth.

Some thirty-six years after Raleigh had set up the British flag on the North American Continent, the *Pilgrim Fathers*, driven by religious persecution, settled at Plymouth (which they named after the English port from which they had sailed in the *Mayflower* in 1620). From this small beginning sprang the "*New England*" *colonies*, to this day foremost among

American States. These colonies are now represented by the States of *Massachusetts* ("Great Hills"), *Rhode Island* and *Connecticut.* Subdivision gave *New Hampshire* (one of the original States), *Maine* and *Vermont.*

The New England States lie N.E. of the *Hudson Valley.* This valley has throughout the history of North America been a line of great strategic as well as (latterly) commercial importance. It affords the best access through the mountains to the interior (*viâ* the Mohawk branch) and to Montreal, one of the strongest positions of the French on the St. Lawrence in the sixteenth and seventeenth centuries, and to-day the largest city in Canada. At the entrance to the Hudson Valley, in a commanding position, the *Dutch* had planted a colony about the time of the settling of the Pilgrim Fathers at Plymouth.

By 1660, the whole Atlantic seaboard from Florida to Maine, with the exception of the Dutch Settlement, was British A struggle was inevitable, and whilst Great Britain and Holland were embroiled in war at home, the British colonists defeated the Dutch, and by the Treaty of Breda, signed in 1667, *New Amsterdam* became *New York.*

1681 saw the foundation of *Pennsylvania* by William Penn, the Quaker, on territory lying between Maryland (a colony similar in origin to Virginia and the proprietary colonies of the South) and the recently acquired territory at the gateway of the Hudson. It was from *religious* and not from *commercial* motives that Penn and his Quaker companions migrated.

The States of *New Jersey* and *Delaware* were among the original thirteen.

The year before New Amsterdam was captured saw *Carolina* founded (1663) in the *mercantile* interests, to be afterwards divided into North and South Carolina respectively. *Georgia* obtained its charter, in 1732, from George II. It extended from the Atlantic back to the mighty Mississippi; the *Spanish* colony of *Florida* cut it off from the Gulf of

Mexico. This latter became United States territory in 1821. The thirteen original colonies practically became the United States on Independence day, July 4th, 1776. The union was completed in 1783 by the Treaty of Versailles. As colonies, they had been exploited by the home-country for trade purposes. The independent spirit of the religious emigrants of the northern colonies; resentment at the non-recognition of their claim for taxation to be accompanied by representation; and the short-sighted policy of coercion adopted by the king and his ministers led to the War of Independence and the founding of the Republic.

It is most convenient, for geographical purposes, to divide the Atlantic States into NORTH and SOUTH. The contrast between north and south is very marked, not only in physical *structure*, *climatic* conditions and consequent *productions*, but also in *social* and *political* matters. The importation of slaves from West Africa to the plantations of the sub-tropical states gave eventual rise to the *Slave Question*, which involved North and South in *civil war* (1861-1865). The victory of the North put an end to slavery within the United States.

*Virginia*, the earliest plantation, belongs on every ground to the South, though it gave to the North its most famous general and to the States their most illustrious President, George Washington.

### (*a*) The Mining and Manufacturing North Atlantic States.

The North Atlantic States are the *most British in character* of all the States of the Republic. They lie on the average *10° nearer the Equator* than our islands, and roughly from 70° to 80° west of the longitude of Greenwich. They are filled with the *parallel ranges* of the Appalachian system, the different unit ranges taking different names in different States. Practically no room is left for a coastal plain; *drowned valleys*, affording fine estuary-harbours for ships, are common. The ranges nearest the coast are oldest and *crystalline* in many places, yielding *granite.* Metals are rare. The inner ranges are rich in *coal*; the coal has, however, been converted to *anthracite* in the mountain-folding processes, as in our own coalfield of South Wales.

The folds gradually diminish toward the interior, until they disappear in the *horizontal* sandstones and coal measures of the *Ohio-Alleghany plateau*, which extends to the Erie-Ontario lake system. Here the coal is unconverted and of the ordinary household *bituminous* quality.

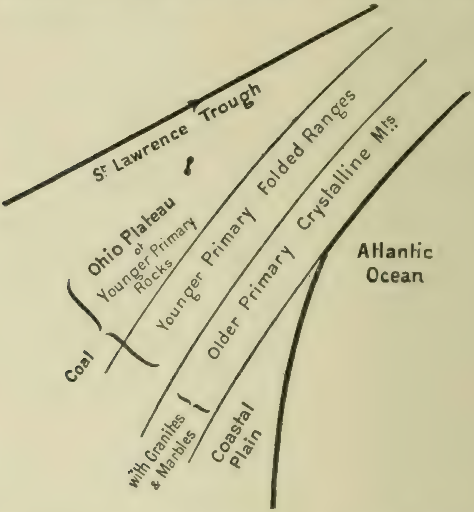
St Lawrence Trough
Ohio Plateau of Younger Primary Rocks
Younger Primary Folded Ranges
Older Primary Crystalline Mts
Atlantic Ocean
Coal
with Granites & Marbles
Coastal Plain

FIG. 34.—STRUCTURE OF THE ATLANTIC STATES.

The porous sandstones of the plateau lying beneath the coal are rich in *petroleum* and *natural gas.* The oil is of better quality than that of most petroleum-areas and exists in enormous quantity. Gas is less plentiful, but can be collected and used for lighting purposes. The oil and gas would appear to be products of destructive distillation of carbonaceous beds. *Iron* accompanies the coal, but is more plentifully supplied from States north of, and beyond, the Ohio.

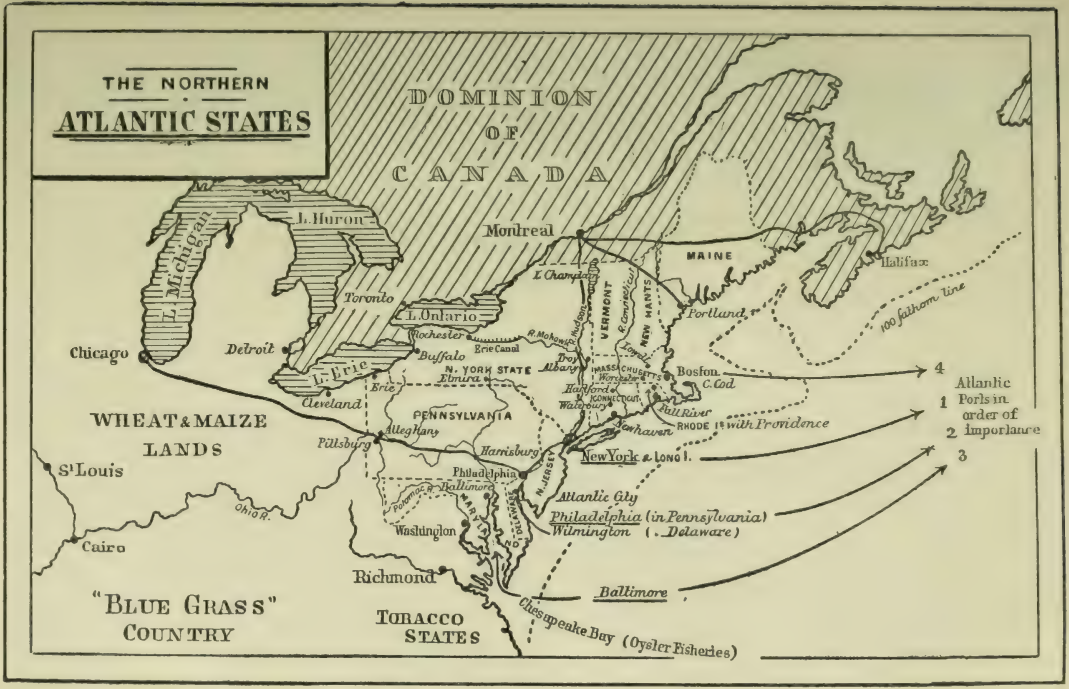

FIG. 35.—THE NORTHERN ATLANTIC STATES.

The **North Atlantic States** have thus a good supply of building stones (granite and the New Red Sandstone of the Connecticut Valley), oil, coal and iron—the foundations upon which great industries may be built. The climate is *cyclonic* in type; the States lie in the track of a prevalent series of cyclones, which often reach the British Isles. Hence we often prognosticate, with more or less success, our own weather from reports of that at New York. The *average winter temperature* is 10° F. below that of the British Isles, whilst *summer* is quite 10° F. hotter. The *annual range* is thus about 20° F. in excess of that of our islands. The reason is not far to seek. The *Gulf Stream drift* scarcely affects these States, whilst a cold current from frigid *Labrador* creeps around the island of Newfoundland, carrying icebergs to these warmer latitudes. The prevalent *cyclones* coming from a continental interior will enhance the heat in summer and intensify the winter's cold.

*Rainfall* is greater along the seaboard than on the Alleghany plateau, corresponding respectively to the rainfall in the west and south of England.

*Forests* clothe the uplands and much timber has been cut. The most northerly State of Maine remains richest in timber.

*Pastures* cover the hill slopes and mixed farming is carried on in the valleys, much as in the mother country. Over on the *Ohio plateau*, where summers are *warmer and drier*, *maize* is cultivated for the fattening of hogs. *Wheat* and *buckwheat* are also cultivated.

**Boston, New York and Philadelphia** are the three great gates to the Northern States, and they stand for the three most important States.

*Boston* is the chief city of MASSACHUSETTS, and rivals Liverpool in size. It is the seat of learning for the Northern States. Harvard University was founded by John Harvard of Emmanuel College, Cambridge, as early as 1638, and the suburb of Boston which has grown up around it takes the fitting name of *Cambridge*. *Lowell* and *Worcester* are important manufacturing centres in the state. The former is the centre of *textile* industries, cotton and wool. Worcester supplies the *machinery*.

The peninsula of Cape Cod shelters the bay of *Plymouth*, where the Pilgrim Fathers landed.

The large, mountainous, forest-clad State of MAINE was originally accounted part of the territory of the colony of Massachusetts. As yet it is the least developed of the Northern States. *Timber* is plentiful and yields pulp for the paper mills, which supply the paper for New York. The rivers supply excellent water power. *Bangor* has, as its name implies, a *slate* industry among these Primary rocks. *Augusta*, on the Kennebec, is the slate capital, but of relatively little importance. *Portland*, the principal harbour, is always ice free, and has made great strides as the winter outlet for Montreal, to which it is joined by the Grand Trunk Railway.

NEW HAMPSHIRE and VERMONT are hilly states divided by the *Connecticut river*. The Appalachian range takes the name of the *White Mountains* (6300 ft.), in New Hampshire and the parallel range in Vermont is called *Green Mountains* (Ver-mont).

Over the Green Mountains from the Connecticut valley is the even more important depression, which, in the north is drained by the *River Champlain*, through the ribbon-like lake of the same name to the St. Lawrence, and in the south by the *Hudson river*, at whose embayment stands New York. Vermont, however, does not share the Hudson river, which is entirely confined to New York State. *Concord*, in New Hampshire, is sufficiently near the Merrimac to join in the *textile* industries. *Burlington*, in the Champlain depression, diverts the *timber* of Vermont to the St. Lawrence.

Along the seaboard, south of Massachusetts, occur two small but busy states—CONNECTICUT and RHODE ISLAND. The geological formation is principally *New Red Sandstone*, as in our vales of Trent, Weaver and Severn. The seaboard is fertile. *Building stone* is plentiful. Manufactures have led to the growth of *Newhaven*, *Waterbury* and *Hartford* in the larger state, and *Providence* and *Fall River* in the small but early-founded Rhode Island. Newhaven and Fall River have many *cotton* factories. Waterbury signifies cheap *watches* and *clocks*. Providence shares the *textile* industries. Newhaven and Providence stand on the main railway from Boston to New York.

The states of NEW YORK and PENNSYLVANIA have pushed back from the original bases of New Amsterdam and Philadelphia until they touch the lakes of the St. Lawrence.

The triangular state of New York has the *metropolis* of the Republic at its apex and the *St. Lawrence highway* as its base. Just within the eastern edge of the triangle, and parallel to it runs the *Hudson depression*, and running into this, at right angles, is the *valley of the Mohawk*, which at one period in geological history carried the drainage of the Great Lakes to the Hudson outlet. North of the Mohawk River rise the beautiful *Adirondacks*; to the south the *Catskill range*. The Hudson is navigable to *Albany*, and thence the *Erie Canal*, following the valley of the Mohawk, carries navigation to *Rochester*, on Lake Ontario. *Buffalo*, where Lake Erie overflows in the river Niagara, is the great river port of the State on the St. Lawrence system, and the focus of a dense population. The Erie Canal avoids the Niagara Falls and joins Buffalo to Rochester. It is *within easy access of Toronto*, the principal city of Ontario. *Troy* is the twin-town of Albany. *Saratoga*, of historic importance (1777), stands higher up the Hudson.

**New York City,** and its suburbs of *Brooklyn*, *Jersey City*, *Newark* and *Staten Island*, baffles description and needs none. It has a magnificent position at the meeting of river, sound and sea. From a Dutch settlement (1664) it has grown to a city of three and a half millions of inhabitants.

The oblong state of PENNSYLVANIA, arising from the original settlement of William Penn at Philadelphia, near the head of the Delaware estuary, in Charles the Second's reign, extends across the Alleghanies from the river (at its eastern frontier) to touch Lake Erie on the west. The lake-port of the same name stands at the opposite end of the diagonal from Philadelphia. Both the Delaware and the Susquehanna (which drains across the state from north to south) are characterised by the *zigzag courses* mentioned in Section III. of Canada. The latter river drains forward to *Chesapeake Bay*. Pennsylvania includes the richest portion of the *anthracite*, *coal* and *iron* areas; and it is as an outlet of these materials, as well as of the products of the resulting industries, that **Philadelphia** has prospered, and grown to a town as large as Glasgow and Liverpool combined. *Textile* industries help to find employment; *wool* is obtained from the sheep-farms amid the Alleghanies.

*Anthracite* is plentiful in the valleys of the Schuylkill and the Susquehanna.

The twin cities of *Pittsburg* and *Alleghany*, on the Ohio plateau, and at a confluence of rivers (Alleghany and Monongahela) are the centres of the *steel* industry and its accompanying manufactures. A *canal* connects them with the lake-port of *Erie*, whence oil is exported and iron-ore imported. It is around Pittsburg, in the hill-region, that *natural gas* is most plentiful. The direct line from *New York to Chicago* calls at Philadelphia and Pittsburg.

Pennsylvania has practically no seaboard; the lower reaches of the Delaware estuary have the small state of NEW JERSEY on the north and the smaller strip of DELAWARE State on the south. Off the coast of New Jersey stands the island-town of *Atlantic City*. Delaware State has its industrial focus and outlet port in the *shipbuilding-centre* of *Wilmington*.

Occupying both banks of Chesapeake Bay, and extending to the *Potomac*, which forms its frontier from mouth to source, is the irregular and straggling state of MARYLAND.

**Baltimore** is nearly as large as Manchester and the gateway of the State. *Annapolis* shares with Baltimore in the export of the oysters from the famous beds of Chesapeake Bay. It is the State capital.

*Harper's Ferry*, on the Potomac in W. Virginia, recalls the futile efforts of John Brown (1859), whose "soul goes marching on."

The small independent district of COLUMBIA contains *Washington*, the seat of government.

### (*b*) The Cotton and Tobacco States of the South.

South of the Ohio and the Potomac, the Alleghany ridges are prolonged in the *Blue Ridge*, the *Smoky Range* and the *Lookout Mountains*. To the west and interior, the Alleghany plateau is continued south in the *Cumberland plateau*, the facies changing from sandstone to limestone, with disappearance of oil and a diminution of coal. *Iron* of excellent quality, accompanied by *coal*, occurs in considerable quantity at the southern terminus of ridges and plateau. The Blue Ridge runs parallel to the Atlantic coast, south of the low, sandy *Cape Hatteras*, and leaves room for a *coastal plain*, *quite 200 miles in width*, which sweeps round the southern base of the uplands as far as the Mississippi delta.

Jutting out from it, but different in geological character in having much coral-reef, is the low, lake-covered peninsula of FLORIDA. Swamps are prevalent along the shore-lines of these southern states.

The coastal plain and its overlooking ridges are occupied by the states of VIRGINIA, the two CAROLINAS, GEORGIA and ALABAMA.

West Virginia, Kentucky and Tennessee occupy the Cumberland plateau, and will be considered in the section on the Mississippi and its feeders.

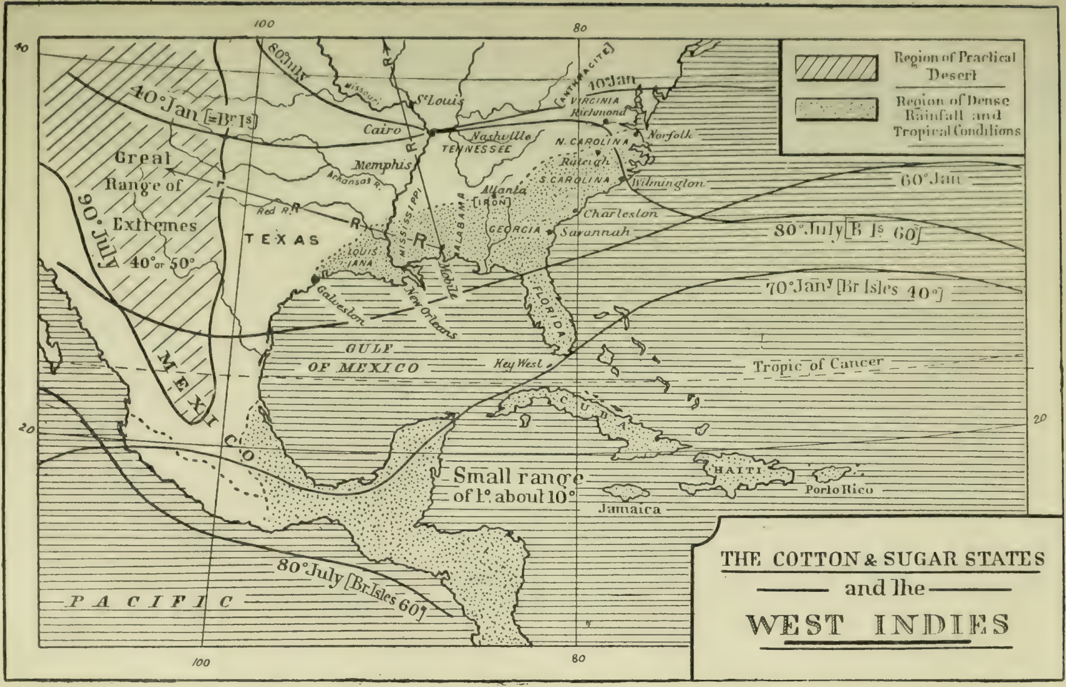

FIG. 36.—THE COTTON AND SUGAR STATES AND THE WEST INDIES.

The coastal plain is covered with loose gravelly and sandy deposits of *Tertiary* age. The soil is light and very productive.

*Rainfall* is considerable, attaining the high average of 60 ins. annually in the culminating region of the southern ridges (*Black Mountains*, 6700 ft.). This high rainfall is accompanied by summer and winter temperatures equal to those of Gibraltar or Egypt.

Such climatic conditions, coupled with a fertile soil, favour the production of *cotton* and *tobacco*. Cotton is cultivated on the *coastal-plain*; tobacco on the valley slopes and the *south-sloping plateau*. It was to these states that *negro slaves* were imported from West Africa. White people are far out-numbered by black, even to this day; they include the planters, overseers and factors; the working population are descended from the negro slaves.

VIRGINIA is essentially a tobacco-growing state; the valleys of the *James River* and the *Roanoke* (only partly in the State) are especially famed for their yield. *Richmond*, the principal town of the State, is the headquarters of the industry.

The three Cotton States of the Atlantic coastal plain have their outlets in *Wilmington*, *Charleston* and *Savannah*. The lower valley of the Roanoke is in NORTH CAROLINA. *Raleigh* is a small tobacco-growing centre in the north of the State. At *Wilmington* the cotton-growing district becomes important.

*Oil* is exported from here, the oil being derived from *cotton-seed*. *Turpentine*, a product of the yellow pine, is an important oil-export.

*Charleston* is the principal cotton-port on the seaboard of the Atlantic and the focus of industry of SOUTH CAROLINA.

*Savannah* comes a good second, and serves as the port of GEORGIA. From Cape Hatteras to Florida the coast is fringed with low, sandy islands, which yield the best quality of cotton. In the market, this goes by the appropriate name of "*sea-island cotton*."

*Rice* and *sugar*, as well as cotton (the student will have noticed how often these crops are associated), are profitably grown. *Fruit* and *vegetable* farms pay, the produce finding ready markets in the great cities of the North Atlantic States.

FLORIDA, originally Spanish territory, and sold to the States in 1821, occupies the coral-belt peninsula which ends in *Cape Sable*, together with a strip of the *Gulf coastal plain* as far as *Pensacola*. The peninsula derives less importance from cotton than from the numerous sub-tropical *fruits* (and especially oranges), which it supplies to northern markets.

*St. Augustine*, the oldest town in the Republic, is the Atlantic outlet. *Key West*, an island off Cape Sable, is a *naval station*, and commands the Florida passage to and from the Gulf.

ALABAMA remains the only state to be considered in this section. Its streams drain in parallel valleys from the terminating valleys of the Appalachian folds to separate outlets on the Gulf of Mexico. The principal river gives its name to the State. Whilst the coastal plain—hot, damp and fertile—shares in the *cotton* and *rice* production of these southern states, the ridges and valleys in the north of Alabama yield excellent *iron*, and some *coal*. The ambitious name of *Birmingham* has been given to the iron centre.

*Mobile* is the port of the State and stands at the mouth of the Alabama River. Next to New Orleans, it is the principal outlet on the Gulf of Mexico for *cotton*.

The main railway line from *New York to New Orleans* follows the foot of the Appalachian ridge, but gives off a branch at *Charlotte* in North Carolina, to link up the ports of the Atlantic coast. *Atlanta*, the capital of Georgia, is the most important station on the line south of Washington.

## II.—The Basin of the Mississippi.

Approximate Co-ordinates of—

Chicago: 87½°W. ┼ 42°N.
St. Louis: 90°W. ┼ 38°N.
New Orleans: 90°W. ┼ 30°N.

The **Continental Interior** of North America is a wide, shallow depression, extending from the Arctic Seas to the Gulf of Mexico. Almost coinciding with the political boundary which marks off the *northern* section as belonging to Canada, and the *southern* half as part of the United States, runs a faint *divide*, built of glacial débris and forming a gentle upswelling of the contours, which throws off streams to the north-east towards the Hudson depression and St. Lawrence trough, and on its southern side gives rise to the Mississippi. This "Mother of rivers," for that is the meaning of its name, persists in a southerly course, roughly parallel to the mountain wall of the Rockies on the western boundary, and to the symmetrically-folded ranges of the Alleghanies on the eastern side, though considerably nearer the latter.

This leaves room for the development of larger tributaries on the west than on the east. The *Missouri* is a far mightier stream than the *Mississippi* itself when they join at St. Louis, and can boast, in the *Yellowstone* and *Platte* rivers, streams as long as the Ohio and its affluents. The *Arkansas* and *Red* rivers are tributaries from the Rockies and enter the Mississippi below St. Louis. From the Alleghanies come the *Ohio* and its feeders, the *Cumberland* and *Tennessee*.

Extending from the mountain ranges on both west and east toward the mid-stream of the basin are *plateaux* which practically coalesce in the north, above St. Louis, but leave room for a long, *bay-like northward projection of the coastal plain* up the river as far as St. Louis, and along the Ohio as far as Cincinnati. The *Alleghany* plateau and its southern continuation, the *Cumberland* plateau, receive more rain than the tablelands at the foot of the Rocky mountain-axis. The rocks are, however, harder, being geologically much older and more consolidated. Earth sculpture has therefore given valleys of cañon-type, such as we expect to find in less rainy regions. This is especially true on the Cumberland plateau of ancient limestone formation. The valley of the *Kanawha* is most striking in this respect.

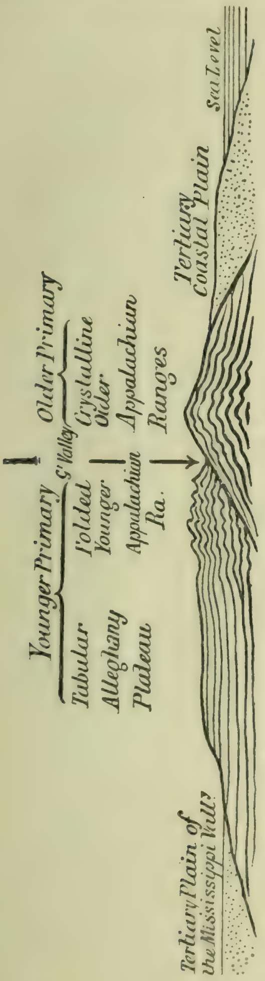
Tertiary Plain of the Mississippi Valley
Younger Primary
Tubular Alleghany Plateau
Folded Younger Appalachian Ra.
G' Valley
Older Primary
Crystalline Older Appalachian Ranges
Tertiary Coastal Plain
Sea Level

FIG. 37.—SECTION FROM THE MISSISSIPPI EASTWARD TO THE ATLANTIC.

The student will have learnt from Chapter II., Fig. 4, that the Rocky Mountains are flanked on the long eastern wall by nearly horizontal beds of Secondary and Tertiary strata. The materials of these beds are much softer and therefore more susceptible to denudation than the older rocks of the Alleghanies. Rainfall is here low and so conditions are more favourable to valleys of the cañon-type. The valleys of the streams from the Rocky Mountains are cut deeply into the flanking plateau, and so divide the once continuous tableland into blocks of country bounded by valleys. These blocks are *steppe-like* in character (owing to low rainfall), and retain in many parts the original Spanish name of *llanos*.

The triangle of plateau between the Missouri and the Ohio is covered with *glacial débris* and the *floor-deposits* of many glacial lakes. It is remarkable how closely the two streams mark the southern limit of glaciation within the Continental Interior. This is the real region of *prairie*, convertible to productive *corn-land*—growing wheat, maize, millet—when put under the plough.

The low-lying coastal plain encircling the Gulf, and extending along the Atlantic seaboard as far north as Chesapeake Bay, also penetrates the Mississippi valley to a similar north latitude. Given rain and warmth, this fertile *Tertiary plain* is everywhere adapted to the cultivation of *cotton*. *Rice* and *sugar* accompany cotton on the shore-lands. *Tobacco* thrives in the valleys which open out on the plain.

The Kansas and Arkansas tributaries, rising in the vicinity of *Pike's Peak*, where the Rockies culminate at over 14,000 ft., separate widely before joining the main streams. Between them rises the *Ozark uplift*, a low dome of ancient rocks from which the overlying younger beds have been denuded (as in our Mendips). The Missouri and the Mississippi follow the northern edge of this uplift (called the Ozark Hills) from Kansas City to Memphis. Along this northern edge lie nearly horizontal *coal measures*.

Temperature is remarkably uniform and high all over the basin in summer; the July Isotherm, 75° F., follows closely the boundaries of the drainage area. Thus, *summers* are exceptionally hot on the corn-lands around St. Paul, on the Upper Mississippi—a fact which favours wheat-growing.

In *winter*, however, temperature belts run almost parallel to latitude-zones, and St. Paul is consideraly colder than New Orleans.

NEW ORLEANS.
July 85° F.
range 30° F. [equable type]
Jan. 55° F.

ST. PAUL.
July 75° F.
range 57° F. [extreme type]
Jan. 18° F.

The greater *range* of the northern city corresponds to a drier climate and a continental interior.

**Rainfall** diminishes steadily as we ascend the Mississippi-Missouri from mouth to source. Again, travelling across the continent by any of the main traffic lines, it falls quickly from east to west. The delta is the wettest area in the basin. The *llanos* are the driest and their *steppe-lands* are best suited for ranching. The "blue-grass" states of the Cumberland plateau have *tobacco* plantations. The Ohio valley is the principal region of *manufacturing* and *mining* industries in the basin; *oil*, *coal* and *iron* are plentiful; *copper* and *nickel*, as well as *timber*, are easy of access from Canada.

The Ohio valley and the course of the main river are naturally the lines of densest population. To these should be added the *lake-frontier*, which affords outlet, *viâ* the St. Lawrence, as well as intercourse with the busiest province of Canada, for the fertile prairies and the resources of the Ohio-Alleghany plateau. It is on river or lake-margin that we must look for the great cities of the Continental Interior.

Traffic, however, tends more and more to ignore the old *navigation-lines* and to strike *transversely* across the basin from the old, highly-developed ports of the Atlantic to the fewer and newer developing gates of the West.

The **Ohio-Cumberland plateau** includes portions of the States of New York and Pennsylvania (already considered on *pp.* 88, 89), together with the States of OHIO and INDIANA on the *north*, each with a frontier on river and lake, and the States of WEST VIRGINIA, KENTUCKY and TENNESSEE on the *south.*

(*a*) The *two northern states* share the *oil* and *coal* industries of the plateau. *Maize* and *wheat* are plentifully grown.

*Cleveland* and *Toledo* are the lake-ports of OHIO on Lake Erie. *Columbus*, in the centre of the State, is the railway focus. *Cincinnati*, on the river, is the most important city, as large as Bristol, engaged in the meat, wheat, coal and tobacco industries.

INDIANA is more remote from the coal and iron industries and more engaged in the *corn* and *meat* trades. Coal does occur, however.

*Indianopolis* is the capital and the railway centre. *Chicago*, just outside the frontier, on Lake Michigan and *Louisville*, just across the river on the Kentucky side, have hindered the development of lake and river ports in this agricultural state.

(*b*) South of the *Ohio* river, the plateau is deeply intersected by the three rivers, *Kanawha*, *Cumberland* and *Tennessee.* WEST VIRGINIA and KENTUCKY occupy the plateau between the Alleghany Mountains and the river, which is their northern boundary. TENNESSEE is an artificial slice of country extending from the *Smoky Mountains* to include a portion of the flood-plain bordering the left bank of the Mississippi. The plateau is famed for its "*blue grass*," limestone caves (the *Mammoth Cave* of Kentucky is the largest in the world) and *tobacco* plantations. *Coal* and *iron* occur,

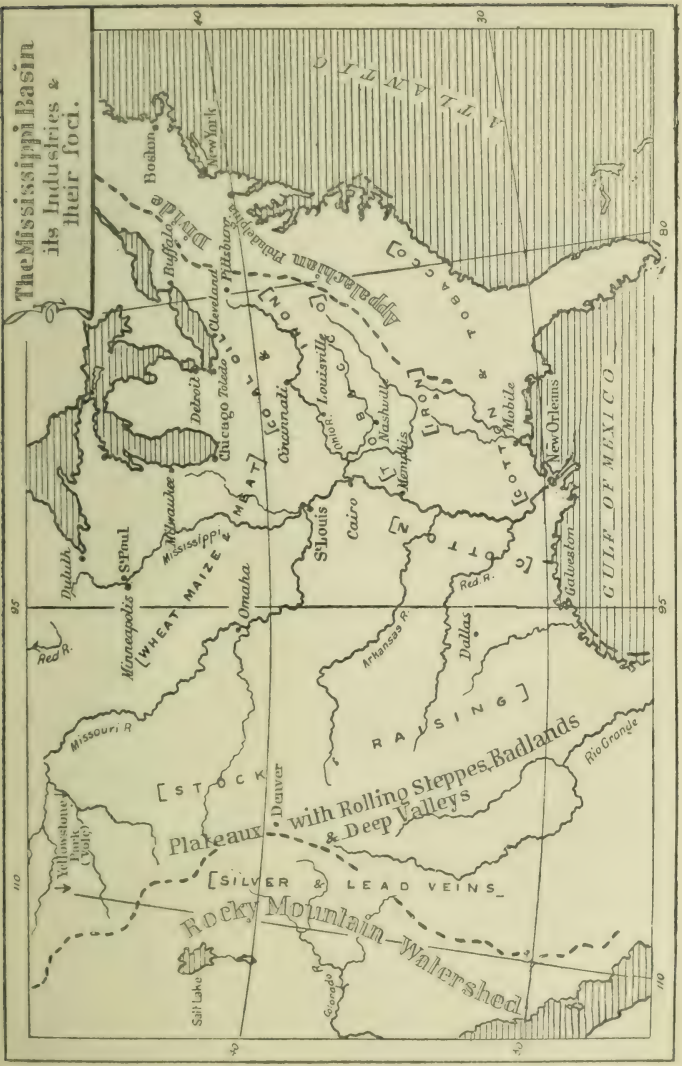

FIG 38.—THE MISSISSIPPI BASIN.

as also excellent *timber.* WEST VIRGINIA has no towns of importance. *Charleston*, in the cañon-like valley of the Kanawha, is the chief. KENTUCKY has its capital and busiest city in *Louisville* on the navigable Ohio. Tobacco is the staple industry. Only the middle courses of the Cumberland and Tennessee rivers (which rise in different states, but join the Ohio at points in close proximity in the State of Kentucky) fall within the State of TENNESSEE. *Nashville* on the one and *Knoxville* on the other stream are the principal cities on the plateau. The former is a tobacco-manufacturing centre. *Memphis*, a busy river-port on the Mississippi, is the focus of trade for the lowland half of the State. *Cotton* can be grown in this area.

What may be grouped as the **"Food States,"** occur on the low plateau between the Missouri and the Great Lakes. West of the Missouri are the foot-hills of the Rockies, which determine largely the course of the Missouri. The Upper Mississippi and its many affluents drain this low plateau on the *south* side of the faintly-marked "divide," and the *Red River*, finding its way to Lake Winnipeg (in Canada), on the *north* side of the watershed. Mention has been made of the mixed soil produced by glacial deposition and by lake-sediments, and of the fertility resulting from it.

The food states have the great advantage of navigable rivers and lake-outlets and it is in connection with these facilities that we must look for the industrial centres. *Wheat* and *maize* are the prime cereals, though *rye* and *oats* are considerably grown. The maize is largely used for the fattening of hogs, and so leads to the *meat industries* associated with these states. The *hot summers* are especially favourable to wheat-growing.

ILLINOIS, with frontiers on the Mississippi, the Ohio and Lake Michigan, is the busiest of the food states. On its western boundary are the important confluences of *Mississippi-Missouri* and *Mississippi-Ohio*, with the very important river-ports of *St. Louis* and *Cairo*, now not depending so much on the river as in the days before the trans-continental railways. St. Louis is, however, across the river, in the State of Missouri.

*Chicago* is the metropolis of the food states, and the largest city in the Continental Interior. It stands second to New York in rank of population among American cities. With the *wheat-lands* to the north-west and the *maize-fields* to the south-east, it has great trade in wheat and meat. A complete network of trunk lines converges on the city, which has a fine position at the head of Lake Michigan. *Milwaukee* serves a similar office for WISCONSIN, another state with the advantage of lake-frontier. *Mineral wealth* (coal, iron, galena, copper) is abundant in these lake-bordering states. *Madison City* and *Green Bay* are foci of industry and population.

The northerly state of MINNESOTA, drained by the head-waters of the Mississippi, has a capital outlet for its produce in *Duluth*, the head of navigation on Lake Superior. Winnipeg, over the Canadian boundary, is near at hand. The "Mother of rivers" is navigable as far as the twin cities of *St. Paul* and *Minneapolis*—both within the State—rivals in food production. Navigation ends with *St. Anthony's Falls*, which, however, afford water-power for corn mills.

The *Red River*, whose prairies are perhaps the most fertile among the lands of the food states, divides Minnesota from the two States of NORTH and SOUTH DAKOTA. The *Upper Missouri* dissects these states, and, moreover, divides them into natural regions. Towards the Red River the *prairies* share in the wheat industry. West of the Missouri the ground rises, and tilled land gives place to *steppe-country*, given over to stock rearing.

NEBRASKA and IOWA, states on opposite banks of the Missouri, show similar characteristics to the Dakotas and Minnesota respectively.

*Omaha* is a busy river and railway centre on the Nebraska side and at the confluence of the Missouri and Platte Rivers.

It has considerable coal resources in its vicinity. *Des Moines* is the topographical and commercial centre of IOWA.

KANSAS resembles NORTH and SOUTH DAKOTA and NEBRASKA in being *steppe-country* to the west and cultivated *prairie-land* towards the Missouri, on which river it has a few miles of frontier and a port in *Kansas City*.

MISSOURI may be considered the transition-state from the "food states" of the northern plateau to the "cotton states" of the Tertiary plain.

It owes much to the mighty rivers which mingle their waters on its eastern frontier, and it is along these rivers that the cities of the State have arisen.

*St. Louis*, the most important river-port in the United States, stands easily first. It forms the meeting-place for wheat, tobacco and cotton growers. *Jefferson City* stands in the middle of the State, on the Missouri.

The lake-bordered State of MICHIGAN should be considered with this northern group. It has frontiers on *four* of the Great Lakes and easy access to the busiest area of Canada. It is an area of Primary rocks and is exceptionally rich in *mineral resources*. *Copper* and *galena* in the older rocks and *coal* and *iron* in the newer Primaries give rise to many industries, and the consequent aggregation of population.

*Detroit* is the foremost of Michigan cities, a focus of American and Canadian railways, a centre of smelting industries, being nearest the St. Lawrence highway. *Bay City*, on the Saginaw arm of Lake Huron, is growing in importance as an ore-smelting centre.

From St. Louis to New Orleans the Mississippi flows over low-lying Tertiary lands, with the *Cumberland uplift* on the east and the *Ozark uplift* on the west. These Tertiary lowlands extend back along the river like a *bay* of the coastal plain. The river brings down much fine silt, and in its sluggish course across the lowlands deposits its load on the flood-plain. To prevent unregulated floods, the river has been banked in the same way as the *Po* at Ferrara and the *Rhine* in Holland; now, by depositing sediment in its own channel, the bed of the river has been raised higher than the level of the surrounding country. Only by means of strong *dykes* can disastrous floods be prevented.

OKLAHOMA, INDIAN TERRITORY and ARKANSAS, drained by the *Arkansas River* on the south of the *Ozark anticline*, have no towns of first importance. The lava-sheets of the *Washita valley* supply excellent grindstones. INDIAN TERRITORY was set apart for occupation by the descendants of Red Indian tribes. It is now amalgamated with the State of Oklahoma (1906).

*Little Rock*, the capital of Arkansas, is a small town of not more than 30,000 inhabitants. It stands on the railway which skirts the western (*Ozark*) edge of the plain from the Ohio confluence to the Mexican tableland. *Helena* is a river-outlet.

The **"Cotton States"** of the Mississippi proper are MISSISSIPPI and LOUISIANA, on opposite banks of the river. The outlets for the cotton are *Mobile* (just over the frontier of MISSISSIPPI, in Alabama, and on the open gulf) and *New Orleans*, at the head of the *digitate delta* of the Mississippi, the principal city of LOUISIANA and the great gateway of the interior.

The cultivation of *sugar* and *rice* on the Gulf plain gives additional industries to these ports. The plantations are, moreover, extending along the unhealthy coastal plain as far as *Galveston* in Texas. This port is built on an island commanding a spacious harbour, and serves as an outlet for the *cotton*, *sugar* and *rice* of the plain, as well as the *cattle* and *horses* for export from the steppe-country behind the coast-lands.

LOUISIANA was the name given to the whole plain west of the Mississippi by the French, when they entered from the south by way of the river, and took possession in the name of Louis the Fourteenth, in 1700. New Orleans was the first settlement. The whole territory was purchased from Napoleon in 1803.

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The lofty Rocky mountain-wall forms the western watershed of the Continental Interior. It runs, like a backbone, through the middle of the States of MONTANA, WYOMING, COLORADO and NEW MEXICO. East of the mountain-wall are the tablelands and *foot-hills*, built of soft *Secondary* and *Tertiary* sediments. These tablelands have been deeply scored by the streams which cross them from west to east to join the Missouri-Mississippi system. They are *steppe-like* in character, owing to diminished rainfall. *Stock rearing* —cattle and horses, rather than sheep—finds occupation for the farmers of these states. TEXAS, the largest state of the Union, ceded by Mexico in 1836, is almost entirely steppe-country; the Rocky Mountains form its western wall, and the Tertiary plain its coastal fringe.

The Rocky Mountain Axis is rich in the precious **Metals**—*gold*, and especially *silver*. Silver is, as usual, accompanied by *lead-ores*. The states of this section may therefore be grouped as the **"Mining States."**

*Butte* is a mining centre near the source of the Missouri. The *Yellowstone River* rises in an area of decaying vulcanicity (as indicated by the presence of *geysers*) just within the north-western angle of the State of Wyoming. The region has been reserved as a *National Park*. A pushful Chinaman from San Francisco had proposed to establish a laundry at the Hot Springs.

*Denver*, *Pueblo* and *Leadville* are important centres in the Colorado mining district. *Denver* is a tourist centre for the fine scenery of the Rockies around *Pike's Peak* (14,140 ft.), *Long's Peak* (14,270 ft.) and the source of the *Colorado River*. *Leadville* is an important silver-mining centre. *Santa Fé* is the principal town, as well as the industrial and railway centre of New Mexico.

At the foot of the Rocky Mountains in Texas is the solitary barren tableland known as the *Llano Estacado* (the staked plain). East of this tableland, as the rainfall increases, semi-desert conditions give way to grass-lands, on which many *horses* are reared.

*Dallas* is the market centre. It has railway communication with *Galveston* on the Gulf of Mexico. The *Rio Grande del Norte* forms a convenient frontier, fixed by the United States when Texas joined the Union.

## III.—The Rocky Cordillera and the Pacific Seaboard.

122½° W.
Approximate Co-ordinates of San Francisco: ┼ 37½° N.

The mountain-system of the *Western States of the Union* differs in many respects from that of its northern counterpart in *British Columbia*. There a series of parallel ranges of descending altitude fill the country between the culminating *Rockies* and *Selkirks*, and the off-lying, partially-submerged chain of islands. In the United States, however, the Cordillera widens out into a *lozenge-shaped mid-region of plateau*, with the lofty range of the Rocky Mountains on the east, and the parallel-ranges of *Sierra Nevada* and the *Coast Range* on the western seaboard. This tabular country is practically unrepresented in British Columbia and the type of country it affords is nowhere else found in the North American Continent. In physical structure and in climatic conditions it stands unique.

The *Rocky Mountains*, previously described, with their *mining* and *tourist* centres, are equally well represented in the giant Selkirks of Canada. Mount Brown and Mount

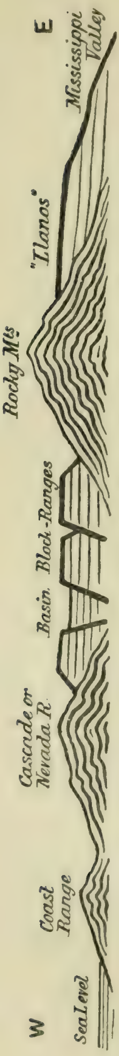

FIG. 39.—SECTION FROM THE PACIFIC EASTWARD TO THE MISSISSIPPI.

Hooker compare with Pike's Peak and Long's Peak in the States. The silver of the States is replaced by copper in the Dominion. The genial climate of British Columbia is shared by the fruitful land of California. The sheltered valleys between the Sierra Nevada and the Coast Range are famed for their *fruit*; the mountain slopes yield abundant *timber* from trees unequalled for size in any other part of the continent. The seaboard is extremely fertile; rainfall is abundant; temperature is, on the average, *10° F. higher* than in British Columbia, since California is further south.

The *contrast of geographical conditions* on the two sides of the Sierra Nevada is as striking as any to be found, either in the Old World or the New. From coastlands and valleys of amazing fertility and magnificent forest scenery, we come upon the barren, mountain-walled plateaux which fill the broad belt between that range and the Rocky Mountains.

Rainfall suddenly *diminishes to one-fourth* of the precipitation on the coastal belt; the southern section of the plateau, across which the *Colorado River* finds its way to the long inter-mont drowned-valley known as the Gulf of California, is considerably drier than the colder northern section, and is practically desert. The *Colorado plateau* in summer is as hot as the Sahara.

Salt-basins occur here, as in nearly all arid districts, that of the *Great Salt Lake* being the most famous. It is cut off from the Colorado plateau by the *Wasatch range*. *Death Valley* is another salt-basin, in which the lakes are well nigh evaporated to dryness.

The whole plateau is *divided into basins* by low ranges, like the Wasatch Mountains. The structure of the country is probably that illustrated in Fig. 39.

Two of the plateaux deserve special notice. The *Colorado plateau*, drained by the river of the same name, is a tabular block of country into which the river and its tributaries have cut deep cañons, which are the wonder of the world. In many places they are 4000 ft. deep, and on their sides are exposed the *whole geological series* of strata from the fundamental *crystalline* rocks, right up to the youngest *Tertiary* sediments. The shape of the section of the cañon suggests diminishing rainfall, for as the cañon has grown deeper, the widening, due to rain-denudation, has not kept pace. (*See* Fig. 40.) The streams are fed by the rains of the Rocky Mountain summits, amidst which they take their rise. Just as the Nile rises in a region of heavy rainfall and then crosses the rainless desert of Libya, so the Colorado cuts its cañons through a practically rainless desert-tableland.

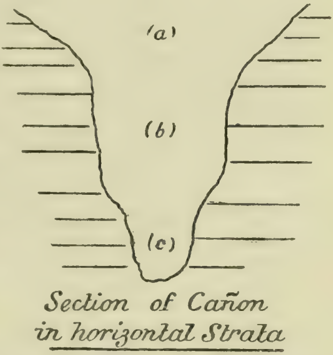

Fig. 40.—Section of Cañon in Horizontal Strata.

The *Snake River* also cuts a magnificent cañon as it makes its way across the *basalt plateau* which fills the northern angle of the Cordillera between the Cascade Range (a continuation of the Sierra Nevada) and the Rocky Mountains. The lava-flows, piled one upon another, that have built up this *Columbia plateau* have an aggregate thickness of nearly a mile, and they cover an area of 250,000 square miles.

The united waters of the Columbia and Snake Rivers find their way to the sea through a *gap* in the Cascade range, just at the foot of the lofty extinct volcano of *Mount Hood.* Other prominent volcanic peaks along this inner range are *Mount Shasta* (14,370 ft.) and *Mount Whitney* (14,900 ft.). The longitudinal valleys between the coast-range and the loftier watershed formed by the *Sierra Nevada* find transverse outlets in gaps in the coast range. The combined waters of the *Sacramento* from the north and the *Joaquin* from the south thus escape into San Francisco harbour.

California, like British Columbia, first attracted settlers by its *mineral wealth*, and more especially *gold*, in the slaty rocks of the Sierra Nevada. Afterwards followed the farmer, who saw in the fertile valleys and genial climate possibilities of *fruit-culture* unrivalled elsewhere in the States. The abundant *timber* attracted lumberers from the eastern states. Some *grain* is grown in the valleys.

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WASHINGTON, OREGON and IDAHO are drained by the Columbia and Snake Rivers, which empty into the Pacific below *Portland.* A longitudinal valley extends to the south from Portland. In it stands *Salem.* This valley opens northward to *Puget Sound*, an arm of the Vancouver Channel. *Seattle* is a port of rapid growth on the Puget Sound. *Tacoma* is growing up quite near. *Spokane* is an agricultural and railway centre on the Columbia plateau.

*Timber* and *salmon* are the chief exports from the Columbia region. The salmon abounds in the *Columbia River.* Salmon tinning is the principal occupation of the people of *Astoria*, at the mouth of the river. *Portland* links trans-continental railways with trans-Pacific steamers.

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CALIFORNIA skirts the Pacific seaboard through 10° of latitude. It extends from the shore back to the summits

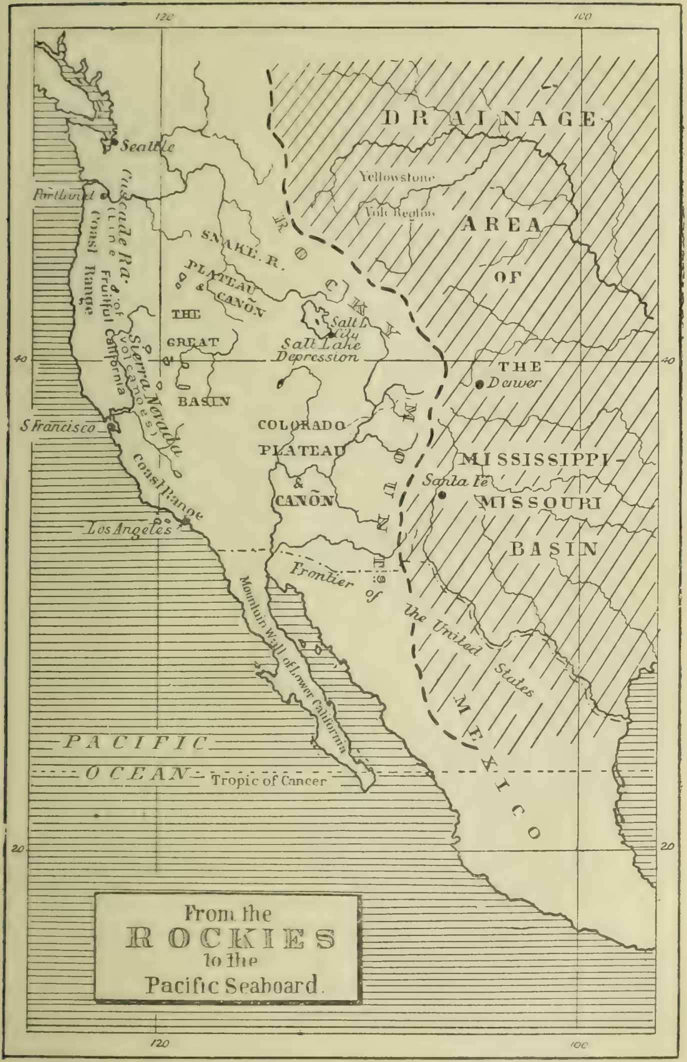

FIG. 41.—THE PACIFIC STATES.

of the snow-clad *Sierra Nevada* (nevada=snowy). It consists therefore of coastlands, coast-range, inter-mont valley and culminating ridge, all parallel to the trend of the coast-line. *Mount Shasta* stands like a lonely sentinel on the northern frontier; the southern boundary touches the *Colorado River.* The mountains are famous for their big trees (*e.g.*, Douglas fir), and the valleys and the coastal plain for their fruit, *pears* and *grapes* being especially profitable.

*Sacramento City* is the industrial centre of the valley. Between it and San Francisco is aggregated the bulk of the population.

*San Francisco* has more than local importance. It is not merely the outlet for the wheat, fruit and timber of the Sacramento valley. It forms the *western terminus* of the most important of the trans-continental lines—the Central Pacific Railroad—and has long been the principal port on the American Pacific. Unlike Vancouver, it has *no coalfield* at hand. The coast-range, on which the town is built just at a sea-filled gap, is liable to earthquake shocks. *Oakland*, across the harbour, is the residential suburb. The old town has a Chinese quarter.

(The world-famed *Yosemite Valley* and the region of "big trees of *Mariposa*" occur in the Sierra Nevada, to the south-east of Sacramento.)

*Los Angeles* is a busy port serving the southern section of the State. It is well placed in relation to the *southern trunk lines* from the "cotton states" of the south-east.

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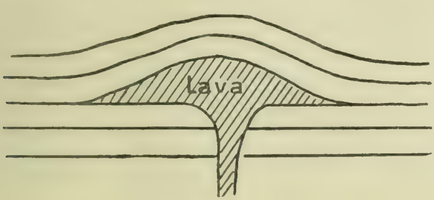
The states of the Cordilleran plateau are NEVADA, UTAH and ARIZONA. The average elevation is quite 6,000 ft. Temperature is so high and rainfall so low that the whole region is *arid semi-desert, with salt-basins* in the two northern states and *barren waste* in Arizona. The *Central Pacific Railway* strikes across Utah and Nevada from Omaha (on the Missouri) to San Francisco. It skirts the northern shore of the Great

Salt Lake, once a fresh-water lake, draining to the *Shoshone River.* The lake stands more than four thousand feet above sea level.

*Salt Lake City* has gained notoriety from its community of Mormons. To the east rise the *Uinta Mountains,* whose domes have been raised by the intrusion of lavas from below into the upper strata, which have become thereby arched into low elevations of characteristic form. Such hidden accumulations of lava are known as *laccolites* (stone-cisterns). Owing to low rainfall, the overlying sediments have not been denuded. It is believed that laccolites are common structures laid bare, and made therefore less obvious, in other regions where the rainfall is considerable.



*Structure of a Laccolite*

Fig. 42.—Structure of a Laccolite.

Arizona is the hottest and most barren of American states. The famous cañons of the Colorado—the *Marble* Cañon and the *Grand* Cañon—are both within this state. The railway from Santa Fé to Los Angeles crosses the plateau to the south, at one point (*French Springs*) approaching to within 40 miles of the Grand Cañon. The lowlands around the lower Colorado are more fertile.

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Alaska, an Arctic territory purchased from Russia in 1867, should be mentioned in this section, since it represents the *northern limits* of the *Rocky Mountain ranges* and the

*Pacific Seaboard.* It has an area at least four times that of the British Isles. The long Alaskan peninsula and its continuation in the *Aleutian Islands* is a chain of volcanoes continuous with those of the opposite Kamsckatkan peninsula. The narrow and shallow *Bering Strait* divides the Old World from the New. A broad *submarine platform*, less than 100 fathoms below the surface, links what seem separated. *Seal* and *cod* fisheries are carried on. The broad valley of the *Yukon*, in whose upper basin *gold* is found, opens out upon the marshy shore-lands of the Bering Sea.

# CENTRAL AMERICA AND THE WEST INDIES.

## I.—The Central American States.

99° W.
Approximate Co-ordinates of Mexico: ┼ 20° N.

South of the United States frontier and the Rio Grande del Norte, the widely separated marginal ranges of the Rocky Cordillera converge to give the V-shaped tableland of **Mexico.** The apex of the V occurs at the *Tehuantepec depression* in long. 95° W. and lat. 17° N. The plateau descends suddenly upon the narrow fringes of coastal plain.

Beyond the Isthmus of Tehuantepec, the folded-mountain-systems have a west-east trend, not north-south, like those of the two continental masses. These transverse ranges divide the ocean separating North America from South into *two distinct inland seas*—the *Gulf of Mexico*, mainly outside the Tropics and the *Caribbean Sea* entirely within. Both depressions are deep. The line of the **Greater and Lesser Antilles** is really therefore the curve of a partially submerged mountain range. Two axes can be distinguished. The outer and more dominant forms the backbone of *Cuba*, the main range of *Haiti* (on the north side) and the chain of islands from *Puerto Rico* to *Grenada*.

*Trinidad* is an outlier of the South American mainland.

The minor range strikes from *Honduras* by a submarine ridge to *Jamaica*, and is continued in the *southern* range of the island of Haiti. Everywhere these Central American

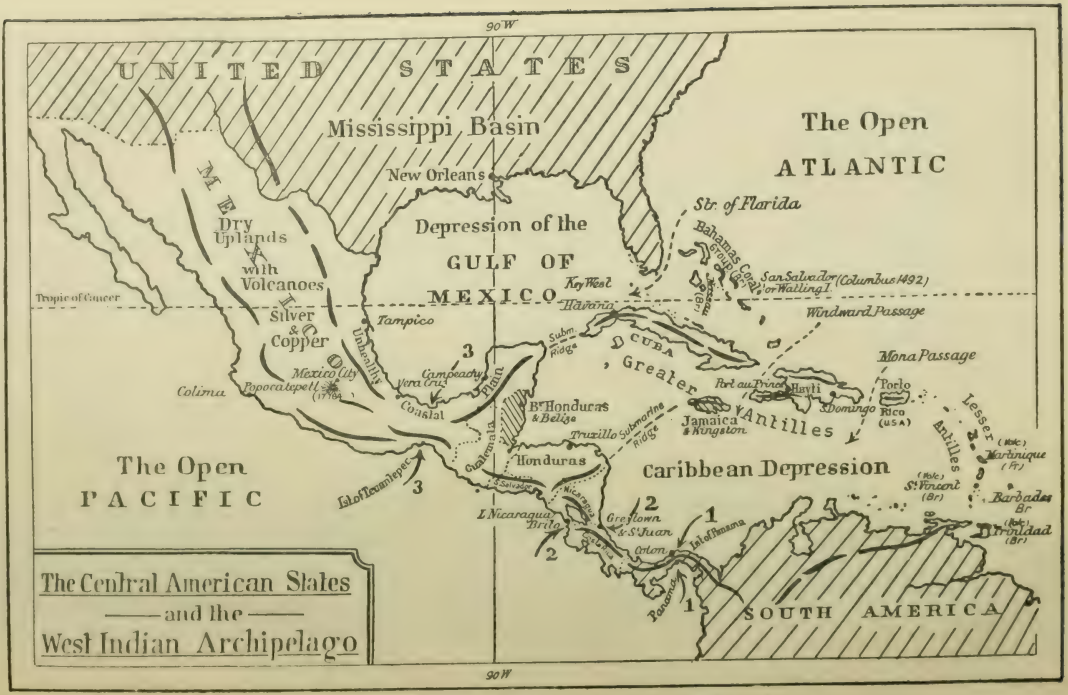

Fig. 43.—Central America and the West Indies.

mountain axes are scattered with *volcanoes*, and more or less subject to *earthquakes*.

The off-lying **Bahamas** group belongs in character to Florida rather than to the West Indian Archipelago.

The linking chain which joins the Rockies of North America with the Andes of South America follows the Pacific seaboard, leaving little or no coastal plain. The isthmus formed by this system is narrowest at *Darien-Panama*, close to the southern continent.

Though some of the islands (*e.g.*, the *Bahamas*), and nearly the whole of the *tableland of Mexico* are outside lat. $23\frac{1}{2}°$ N., the whole region is practically tropical in character. The extra-tropical portion of the Mexican plateau is *hotter* in July than any island within the tropics. It resembles Texas rather than Central America in character and is thinly peopled. The numerous cities of Mexico fall within the tropic of Cancer.

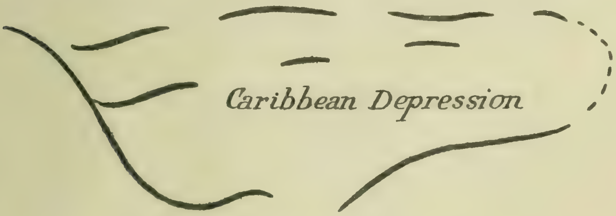

FIG. 44.—CARIBBEAN DEPRESSION

The **range** between summer and winter average temperatures is greatest on the tableland, reaching as much as 25° F. (90° F.-65° F.). But in the archipelago it sinks to less than 10° F. (80° F.-72° F.). The *mean annual temperature* is 30° F. hotter than the British Isles.

**Rainfall** is very considerable, exceeding *75 ins. annually* on the coastal plains fringing the two depressions, and is derived from winds blowing in *from the Atlantic* rather than from the Pacific, along whose coast rainfall is decidedly less. The Mexican plateau, shut in by mountain-barriers, and therefore a region of *rain-shadow*, has the lowest rainfall, and hence the maximum range mentioned above.

The rainy lowlands are extremely unhealthy, as in all tropical countries. The hill slopes and the tableland have a comparatively fine climate.

It is the unhealthy lowlands that are especially productive. *Cotton*, *sugar* and *rice* thrive on the plains; *tobacco*, *coffee* and *tropical fruits* (*e.g.*, the banana and the lime-fruit) on the slopes. *Spices* and *drugs* are grown on the islands and shore-lines. Forests of *mahogany*, *rosewood* and *ebony* clothe the hill-country.

The healthy tableland is less productive agriculturally. Grassy *steppes* are common. *Maize* can be successfully cultivated. In **mineral wealth**, however, the plateau is very rich, whilst the ranges of the archipelago are extremely poor. *Silver* is the most important, though gold, copper, lead and mercury occur.

The *gaps* in the chain of the Antilles allow access of vessels from the Atlantic to the Caribbean depression. The principal channels go by the names of *Windward Passage* and *Mona Passage*. *Florida Channel* admits to the Gulf of Mexico. As yet no way across the isthmus for ocean-going vessels is available. Projects for a canal on the scale of the Suez Canal have been put forward. The earliest was that of the proposed *Panama Canal*. M. Ferdinand de Lesseps failed here after succeeding at Suez. A *mountain-backbone* to cut through and a terribly heavy death-roll, owing to the *unhealthy climate*, postponed the scheme indefinitely. The United States Government is now considering the problem. Rival routes propose to follow the *Nicaraguan* and the *Tehauntepec* depressions respectively. The position of these is indicated on the map Fig. 43 (note 1, 2, 3). The last named has the greatest advantage of climate.

The student should consult a globe, with a view to ascertaining how much the journey to Australia would be shortened if any of these canals allowed the passage of ocean-going vessels.

---

MEXICO is larger and more important than all the rest of the States on the Central American isthmus. The Spaniards sailed to the west, according to the papal bull of Alexander VI., and in 1519 settled on the Mexican part of the isthmus; Cortez completed the conquest in 1522. Here they found a highly civilised tribe, the **Aztecs**, living on the plateau.

Many *splendid ruins* of Aztec cities remain to this day. The Spaniards who had colonised the Greater Antilles had been attracted by the vast *mineral wealth* of the plateau. The mines had been worked for six or more centuries and much silver and gold had accumulated. This the *Spanish sailors* seized and brought home to Spain, then in the heyday of her prosperity.

Since the sixteenth century the country has had a chequered history. To-day it is a *republic* of twelve million souls. The chief cities are on the healthy tableland; the ports are of necessity on the unhealthy coastal plain.

*Mexico* and *Puebla* are the most important upland towns. The former is the *capital* and about as large as Bradford. The latter is the industrial centre of the plateau; it exports *sulphur* from the neighbouring volcanoes of *Popocatapetl* and *Orizaba*, cones rising 11,000 ft. above the plateau, which itself attains a height of from six to eight thousand feet above the sea level.

*San Luis Potosi* is an important *silver*-mining centre; *Guanajuato* has *gold*-workings.

Mexico and Puebla find an outlet in *Vera Cruz*; Guanajuato and San Luis Potosi in the healthier port of *Tampico*.

*Jalapa* is the market-centre of the coastal fringe.

*Mazatlan* and *Acapulco*, much healthier than the Gulf ports, are calling-places for tramp-steamers on the Pacific seaboard.

The forest-clad plateau of **Yucatan**, much lower than the tableland of Mexico, belongs to the Republic.

*Campeachy* is the export town.

---

The remaining states of the isthmus are Guatemala, Honduras, Nicaragua, San Salvador and Costa Rica. They share the common characteristics of tropical mountainous lands, resembling the members of the archipelago rather than the broad tableland of Mexico. **Great Britain** holds a portion of Honduras, with *Belize* as its port.

## II.—The West Indian Archipelago.

Approximate Co-ordinates of—

| | | |
|---|---|---|
| Havana: | 82½° W. | 23° N. |
| Kingston: | 77° W. | 18° N. |

The **major islands** of the West Indian Archipelago are Cuba, Haiti, Puerto Rico and Jamaica.

The long, mountained-walled island of Cuba is especially famed for its *tobacco* plantations. *Havana* is the capital and principal port, since cultivation is chiefly in the west of the island. *Santiago* serves the eastern end of the island and stands close to the Windward Passage. *Coffee* is an important export.

The island has had an eventful history. Remaining under *Spanish* rule till the nineteenth century, it chafed at interference and bad government. In 1898 the *United States* stepped in. After the Battle of Santiago, Cuba came under the protection of the United States until 1902, when it became an *independent republic*. Spanish descendants and negroes form the bulk of the population.

Haiti has been even more unfortunate than Cuba in its long history of insurrection and bad government. It was the first of the islands to be colonised by Spaniards; the French secured the western section (HAITI) toward the end of the seventeenth century; the Spaniards retained the eastern and larger section (SAN DOMINGO). The two sections now form twin republics within one small island. Negroes and mulattos far outnumber the white population.

*Port au Prince*, the capital of Haiti, recalls the French footing gained in the island. *San Domingo* (the Spanish form of Saint Dominic) is the capital of the less prosperous republic of the east.

In addition to some *tobacco* and *sugar*, much *coffee* is grown in this island.

PUERTO RICO, once, like the rest, a *Spanish* colony, became a possession of the *United States*, after the Spanish-American War of 1898. *San Juan* is the port and capital.

JAMAICA is the largest **British possession** in the West Indies. It was taken from the Spaniards in the middle of the seventeenth century, during Cromwell's administration. *Tobacco* is an unimportant crop in this island. *Sugar* and *coffee* are the principal productions. *Jamaica rum* is a bye-product of the sugar.

The sugar industry has declined owing to severe competition from the *beet-sugar* of the European plain. *Fruit-culture* is profitable. The island is subject to severe *earthquakes*. *Kingston*, the capital, has only in recent years (1906) suffered. The old capitals, *Port Royal* and *Spanish Town*, had previously experienced a similar fate.

---

The curved chain of small islands linking the **Greater Antilles** with the coast-range of the South American Continent is called the **Lesser Antilles**. The islands of the group all resemble one another in being *volcanic peaks*, rising from a submarine ridge. They enjoy the same climate; they yield the same productions, chief among which are *coffee*, *sugar* and *lime-juice*. They have wet summers, accompanied in the hottest months by devastating hurricanes, and dry winters; *i.e.*, the climate is *monsoon* in type.

Several of the islands are fringed with *coral reef*, whilst some are completely enveloped in coral-rock. The *warm oceanic currents*, bearing food, approach these *mountain-stumps*, which serve excellently the necessary conditions for coral colonies.

**Barbados** and **St. Yincent** are the most interesting of the British members of the group. The eruption of *La Souffrière* in the latter island, coincident with the more serious eruption of *Mont Pelée*, in the French island of **Martinique**, will be easily recalled by the student. Barbados is a veritable garden on a coral soil.

**Trinidad** stands outside the group, as an outlier of the South American coast range. It is famed for its pitch-lake.

The coral-island group of the **Bahamas** contrasts in many ways with the islands of the archipelago. They are low in elevation and monotonous in scenery. Rivers and streams are absent, owing to the porous nature of the rock. Rain-water has to be used for drinking purposes. The climate is hot, but delightful, varying little throughout the year; the islands are becoming popular as a winter *health-resort.*

*Watling Island* is the original *San Salvador*, where Columbus first touched American soil in 1492.

*Nassau* is the headquarters of government in the British group.

Away to the north-east, in the Atlantic, is the smaller coral group of the **Bermudas**, used as a British naval base. *Hamilton* is the capital.

Both the Bahamas and the Bermudas grow *fruits* for the American markets.

# Typical Exercises on the Maps.

(1) Find the area of (*a*) Texas, (*b*) the Great Lakes and (*c*) Nova Scotia by means of transparent squared paper ($\frac{1}{10}$ in. squares).

(2) Mark on the map of North America the 1000 ft. contour-line and the 100-fathom line.

(3) Draw sections, by aid of a contoured map:—

- (*a*) From Vancouver to Winnipeg;
- (*b*) From San Francisco to the Mississippi (due east);
- (*c*) From Toronto to New York.

(4) On a blank map of North America, insert the courses of the St. Lawrence, the Hudson, the Saskatchewan, the Missouri-Mississippi and Ohio, the Colorado and the Columbia Rivers. Mark the regions of greatest rainfall, the areas of extreme summer and winter range, and the direction of ocean currents.

(5) Give a sketch-map of (*a*) the Atlantic States from Boston to Baltimore, (*b*) the Ohio-Alleghany plateau, (*c*) the St. Lawrence valley, (*d*) the gold-mining valleys of British Columbia, (*e*) the "Cotton" States, (*f*) the West Indian Archipelago, (*g*) the Pacific States, (*h*) the "Food" States around the Upper Mississippi.

(6) Trace the four main railways which cross the continent from the Atlantic to the Pacific. Describe the varied country crossed by the Canadian Pacific Railway, the Central Pacific Railroad and the Southern Pacific Railway.

(7) Analyse the position and account for the importance of the following cities:—

Montreal, Toronto, Winnipeg, Victoria (B.C.), New York, Philadelphia, Chicago, St. Louis, New Orleans and San Francisco.

(8) Describe in detail any of the following:—

The Great Lakes; the Colorado Plateau; the Yosemite Valley; the Mexican Tableland; the Hudson Bay Depression; the Lesser Antilles.

(9) From what regions of the continent do we get nickel, gold, oil, cotton, cattle, maize, wheat, anthracite, timber, furs and sugar? What towns are engaged in the collection and export?

# APPENDIX.

## The Bearing of Geology upon Geography.

(*Intended for those who have not used Books I. and II. of this series.*)

THE earth's crust is largely covered with a mantle of stratified rocks. In every continent, when we bore through the series of strata, we come upon crystalline rocks. The floor on which all sediments rest is therefore crystalline, and it seems probable that it is from this primeval crystalline floor that all sediments have been derived by denudation followed by deposition under water. In many regions these crystalline rocks are uncovered by sediments (*e.g.*, Finland and Labrador). Some of the very oldest sediments seem to have been so remarkably altered in the processes of mountain-making that they too are crystalline. In these, as in the original (non-sedimentary) crystalline rocks, fossils have, hitherto, not been found. These *reconstructed crystalline rocks* are a problem to geologists on this account.

Granites and lavas are crystalline rocks of a different type, having been up-thrusted from below, in the former case *into* overlying rocks, in the latter case *through* the superimposed strata, to flow out on the earth's surface, where they have solidified on cooling.

For the purposes of Geography the whole series of rocks which go to make up the earth's crust may be classified most conveniently in five sections as follows :—

| | | | |
|---|---|---|---|
| 3 **Tertiary** and Recent | | gravelly type ... | 3 |
| 2 **Secondary** (Middle-Aged) | | limestone type ... | 2 |
| 1 **Primary** (Ancient) | Younger | sandstone type ... | 1*c* |
| | Older | slaty type ... ... | 1*b* |
| | | crystalline type ... | 1*a* |

If strata were everywhere horizontal, then, where all the members of series were present, only the Tertiary and Recent rocks would appear at the surface; Secondary rocks would lie cencealed below them; Primary rocks would only be reached by deep borings or in deep ravines. Such a ravine-exposure is actually seen in the Canyon country of Colorado.

But if, by any forces of nature, strata have been tilted or folded, the possibility arises of Primary and Secondary rocks appearing at the surface and contributing to the character of the scenery and the soil, as well as giving access to new mineral resources. Such is the case. Tilting and folding of strata are the rule and not the exception, and result in variety of scenery, resource and industry.

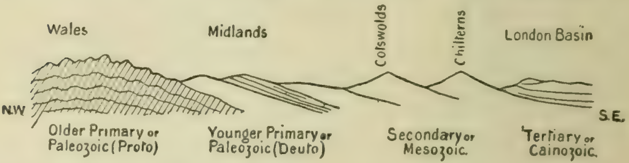

FIG. 45.—SECTION ACROSS ENGLAND AND WALES, N.W.-S.E.

Figs. 45, 46 and 47 show how a diversity of surface may arise when a series of strata of varying hardness is exposed to the sculpturing action of denudation.

**Primary Rocks.**—The **Older** Primary Rocks, being very ancient, are much altered from their original condition. Two types prevail, as indicated in Fig. 45. The *Crystalline* type includes rocks much crumpled and folded, complex in composition and schistose (=split-able) in character—the products of the processes of mountain-making. Granite "bosses" generally accompany them. Mineral veins are scarce (*e.g.*, the Highlands of Scotland). The Primary Rocks of the *slaty* type are sedimentary rocks which have suffered less change from crumbling and folding. Granites are not so plentiful, but volcanic materials abound, forming in England the bulk of the chief mountain piles (*e.g.*, Snowdon and Helvellyn). Precious metals occur. Slate is quarried (Cumberland and N. Wales).

The **Younger** Primary Rocks include the *Old and New Red Sandstones* with the *Coal Measures* between. It is seldom, however, that all three series are found in the same district (the flanks of the Mendips offer an example). The rocks vary in type in various districts, but sandstone, red or brown, and grit form the typical rocks.

The Old Red Sandstone is represented in places by marine limestones (*e.g.*, Devonshire).

The New Red Sandstone may be replaced by Limestone in one region (*e.g.*, Durham), whilst the typical red and chocolate Sandstones predominate in another (*e.g.*, Cheshire).

The Coal Measures vary greatly in different districts, but, for the purposes of physical geography, may be taken to consist of :—(*c*) Coal-bearing flagstones and clay, (*b*) Grit, (*a*) Limestone.

The *Limestone*, when exposed, gives fine scenery and caves (*e.g.*, Matlock, Cheddar). Lead veins are common in the limestone wherever volcanic rocks have been intruded into it. The *grit* makes a durable building stone, as in Yorkshire and Lancashire, but is hard to work.

The New Red Sandstone often conceals the coal measures, since it generally lies horizontally (*e.g.*, Trent Basin).

**Secondary Rocks.**—Strictly speaking, the upper half of the New Red Sandstone introduces the Secondary series, though in rock-characters it is unlike any of the members of that series. The reasons for its classification with them are zoological not lithological (Gr. *lithos*=stone). The Secondary rocks are usually plains of clay and ridges of limestone sculptured out of gently tilted strata. The older limestones are hard and in places oolitic (Gr. *oon*=egg, *lithos*=stone, composed of roe-like grains) in structure. They make some of the best building stones (*e*.g., Bath and Portland). Ironstone bands are common. The younger limestone is a soft friable limestone, very pure, often rich in flints. In England it is represented by the well-known chalk hills of the London and Hampshire basins. The clays form rich agricultural basins.

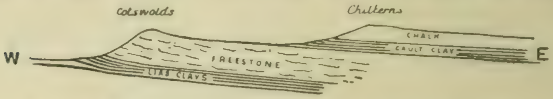

FIG. 46.—SECTION ACROSS THE MESOZOIC RIDGES.

**Tertiary Rocks.**—These strata are chiefly stiff clays, loose sands and gravels. Building stones are not common. Mineral ores are practically absent. They lie upon the Secondary rocks in troughs and along coastal plains (*e.g.*, Thames Basin and Holderness).

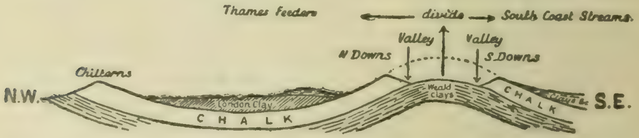

FIG. 47.—SECTION ACROSS THE CHALK RIDGES OF THE SOUTH-EAST OF ENGLAND.

**Glacial Débris and Alluvial Lands.**—Over the plains and slopes of countries which in the ice-age lay buried beneath the ice-cap, is spread a mantle of glacial débris left by the shrinking of the ice on the accession of warmer climatic conditions. The materials are irregularly bedded, as the débris lies simply on the sculptured surface of the pre-existing strata. The deposits also vary in composition according to the character of the rock traversed and eroded by the ice-sheet in its outward creep.

Alluvial lands and flood-plains represent the most recent sediments, sometimes classified along with glacial deposits as **Quaternary.** They are, however, so constantly associated with the Tertiary rocks that for geographical purposes the classification adopted in this chapter suffices.

# Glossary of Geological Terms Used in the Text.

**Agglomerate.**—The mixture of volcanic and sedimentary material found in the throat of a volcano.

**Alluvium.**—The sandy deposits laid down in the flood-plains, haffs and mouths of rivers.

**Anthracite.**—A modified form of coal, nearly pure carbon, bright and brittle. Found in folded regions, where pressure and heat have driven off the coal-gas—forming constituents present in ordinary coal.

**Basalt.**—A compact, dark-coloured lava, rich in iron constituents.

**Boss.**—A rounded dome of granitic, crystalline rocks, exposed by the weathering of overlying strata.

**Boulder Clay.**—*See* "Till."

**Coastal Sill, or Foreland.**—A flat strip of country running parallel to the shore; usually of a rock-platform character.

**Crust-block.**—A block of country, roughly polygonal in outline, and bounded by fracture lines, around which the country has subsided to form basins, leaving the tabular mass standing as a plateau.

**Denudation.**—The wearing down of strata, the crumbling of rocks, by the action of rain, wind, sun and ice.

**Detritus.**—The rock-waste resulting from denudation, including alluvium (*see* above), gravel, deltaic materials.

**Diorite.**—An igneous rock of deep-seated origin, very crystalline, greyish, to greenish-black in colour, very compact; richer than granite in iron-bearing minerals.

**Dip.**—The general angle of slope of a stratum, or layer, of sediment.

**Drowned Valley.**—A valley into which, owing to the subsidence of the hilly coast, the sea has crept and formed a firth or fiord.

**Dyke.**—A vertical fissure in the Earth's crust, in-filled with lava, which has solidified *in situ.*

**Escarpment, or Scarp.**—The cliff-like inland termination of a layer of hard rock sandwiched between beds of softer materials, exposed owing to the resistance to denudation; often running for miles in ridges.

**Fault.**—A fracture, more or less vertical, produced in a group of strata by strain in the Earth's crust. The beds on one side have suffered displacement relatively to the beds on the other side.

**Flood-plain.**—The flat, gravelly meadow-land over which a river meanders, continually modifying its course, and which in time of heavy rains lies under water.

**Fullers' Earth.**—A clayey, fine earth, found in the strata of the Middle Age. Used in the "fulling" or cleansing of raw wool because it absorbs the oil.

**Grikes.**—Joints in limestone, widened by the solvent action of rain.

**Grit.**—A tough sandstone, in which the grains are more than usually angular, and therefore better interlocked with each other (*e.g.*, Millstone Grit).

**Gypsum.**—Sulphate of lime ($CaSO_4 2H_2O$), occurring in crystals and in fibrous layers; used in the manufacture of Plaster of Paris.

**Horst.**—A German term for a "saddle" of crystalline igneous rock. Comparable to a "boss" whose inner belt has subsided, giving the saddle form.

**Kaolin.**—China clay, nearly pure white; derived from the weathering of pure granite.

**Massif.**—A French term, applied to granitic mountain-cores.

**Moraine.**—The detritus carried down by glacial action and eventually deposited at the melting end of the glacier.

**Oolite** (**or Roe-stone**).—Egg-stone. A limestone built up of minute roe-like grains.

**Outcrop.**—The termination at the surface of strata which dip below other strata.

**Outlier.**—A mass of stratified rock (often a hill in dimensions) detached from the group of strata to which it belongs by the agents of denudation.

**Roe-stone.**—*See* "Oolite."

**Schist.**—A crystalline rock which easily splits in one direction; generally derived from clays, and reconstructed under the influence of heat and pressure.

**Sill.**—A tabular, horizontal bed of hard rock (*e.g.*, sandstone), but usually refers to lava-sheets intruded between sediments.

**Stalactite.**—The icicle-like pendants of limestone hanging from the roof of a cave, deposited from dripping water which has percolated through from the surface.

**Stalagmite.**—The corresponding deposit spread out on the floor of a cave.

**Stratification.**—The deposit, by the agency of water, of one sediment upon another in layers.

**Till** (**or Boulder Clay**).—The irregularly bedded clay-with-stones left on the retreat of a glacier, or ice-sheet.

**Unconformity.**—The case of one group of strata overlying an older group of strata, but out of parallelism therewith, implying a tilting of the earlier group before the deposition of the later beds.

**Volcanic Neck.**—The consolidated material which fills the throat of a volcano after the cessation of eruption.

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